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Report of the Forest Service

Fiscal Year 1979

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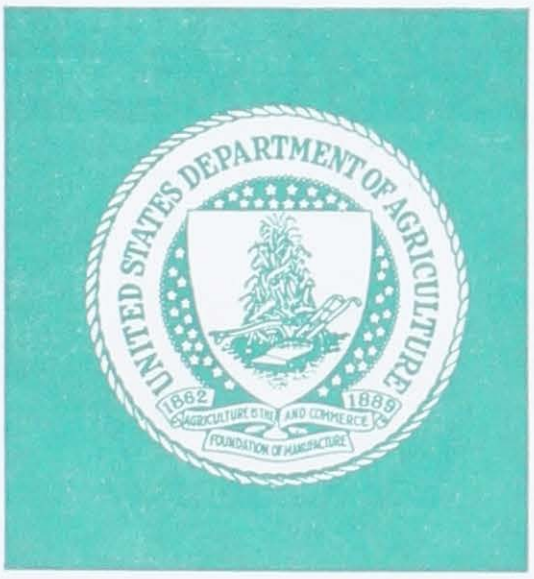

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UNITED STATES DEPARTMENT OF AGRICULTURE

REPORT OF THE FOREST SERVICE

FISCAL YEAR 1979

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INTRODUCTION

This report of the Forest Service, U.S. Department of Agriculture, to Congress describes the progress of agency programs during fiscal year 1979. The report is required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976, the Cooperative Forestry Assistance Act of 1978, and the Forest Renewable Resources Research Act of 1978. This report measures the accomplishments of the Forest Service against the yardstick of the goals established by the 1975 RPA program. Analysis of multiyear costs and benefits of Forest Service programs are included in the 1980 update of the 1975 RPA Program which is scheduled for publication in the near future.

In developing the long-range RPA program, the management activities of the Forest Service were grouped into seven "resource systems." These systems are outdoor recreation, wilderness, wildlife and fish habitat, range, timber, land and water, and human and community development. Physical data and social and economic information about all the renewable resources in the Nation were compiled including an up-to-date inventory, an estimate of future uses and demands, and opportunities for affecting the yield of the resources. This became the RPA Assessment, and the information was used to formulate several broad alternative objectives for each resource system and then to develop specific targets to meet either high or low levels of resource outputs for each objective. Using information gathered from public comments on the alternative programs, one program, with one level of production for goods and services for each resource, was chosen.

A 1980 update of the Assessment and program has been completed, as required by law, and will be the framework used to guide Forest Service activities in fiscal years 1981 through 1985. Other updating will follow periodically.

Each of the seven systems includes elements from the four major areas into which Forest Service activities can be divided. These areas are:

* Research in forestry, forest products, and management of the Nation's forests and rangelands.

* Cooperation with State foresters, private forest and woodland owners, wood processors, and private and public agencies in an effort to improve the quality and increase the quantity of goods and services from forest lands through scientific management and utilization of forest resources.

* Management, protection, and use of the 187-million-acre National Forest System for a sustained flow of economic and social benefits.

* Use of basic forestry activities to help minority, economically depressed, elderly, and handicapped people and youth groups.

General accomplishments during the year included completion of the Roadless Area Review and Evaluation (RARE II); completion of the final regulations to guide future land and resource planning on the National Forest System; and the development of the draft Assessment and Program for the 1980 update of the RPA, gathering and analyzing the public comments on the drafts, and preparation of the final documents for transmittal to the President early in 1980.

Research accomplishments from the more than 3,000 individual studies underway ranged from development of a "micro-chip" that can be used in handheld calculators for assessing how a forest fire will behave to findings that dead timber once thought to be worthless can be used in a wide variety of products.

Cooperative forestry efforts specifically benefited more than 191,000 landowners and resulted in forest management plans covering reforestation, wildlife habitat, recreation, marketing, processing, and associated activities for 3 million acres of private forest lands.

During the year, the Forest Service sold more than 11.3 billion board feet of National Forest timber. In addition, some 700,000 individuals or families collected more than 3.2 million cords of free firewood on National Forests. The agency seeded, planted, or prepared the land for natural timber regeneration on 446,000 National Forest System acres and improved timber stands on another 477,000 acres. About $82.6 million was spent by the Forest Service to fight some 10,500 wildfires--damage was held to about 445,000 acres. National Forests provided more than 220 million visitor-days of recreation, and fish and wildlife habitat was improved on more than 974,000 acres.

Human resource programs administered by the Forest Service provided employment and training for 109,825 people. These people accomplished the equivalent of 16,617 person-years of conservation work values at $164.1 million.

Many other major accomplishments are described later in this report.

SECTION A

RESEARCH PROGRAM

Introduction

As part of the Forest Service program, research is conducted through a network of eight Regional Forest Experiment Stations and the internationally recognized Forest Products Laboratory at Madison, Wisconsin. Field studies and laboratory research are conducted at 81 locations throughout the United States, Puerto Rico, and the Pacific Trust Islands, as well as in the outlying States of Hawaii and Alaska. Figure 1 shows the Regional Stations, the location of Station headquarters, and major laboratories.

The research program of the Forest Service is administered by a Deputy Chief with a staff of nine field Experiment Station Directors and seven Washington Office technical staff directors. The specific units are shown in figure 1.

More than 3,000 individual studies are conducted by approximately 980 scientists in 230 projects, which produce an average of 1,500 scientific publications annually. In 1979, the appropriation for research totaled $110.9 million; of this amount, approximately 10 percent supported cooperative and other studies with colleges, universities, and other research organizations. A complete breakdown of the budget is shown in appendix table A 1.

The Forest Service research program, through basic and applied studies, develops new technology needed for public land management activities as well as for State agencies, other public entities, various private organizations, the small woodland owner, and individual private citizens including the urban dweller.

Scope of the Research

The Forest Service research program addresses a variety of problems associated with increasingly complex land management challenges. The scope of the research program includes studies in seven broad areas: (a) timber management, (b) environmental research including range, wildlife, and fish habitat; watershed management; surface mineland rehabilitation; and recreation, (c) fire and atmospheric sciences, (d) forest insects and diseases, (e) renewable resources evaluation and economics, (f) forest products utilization and engineering, and (g) international forestry programs. A more complete description of the research program can be found in appendix A.

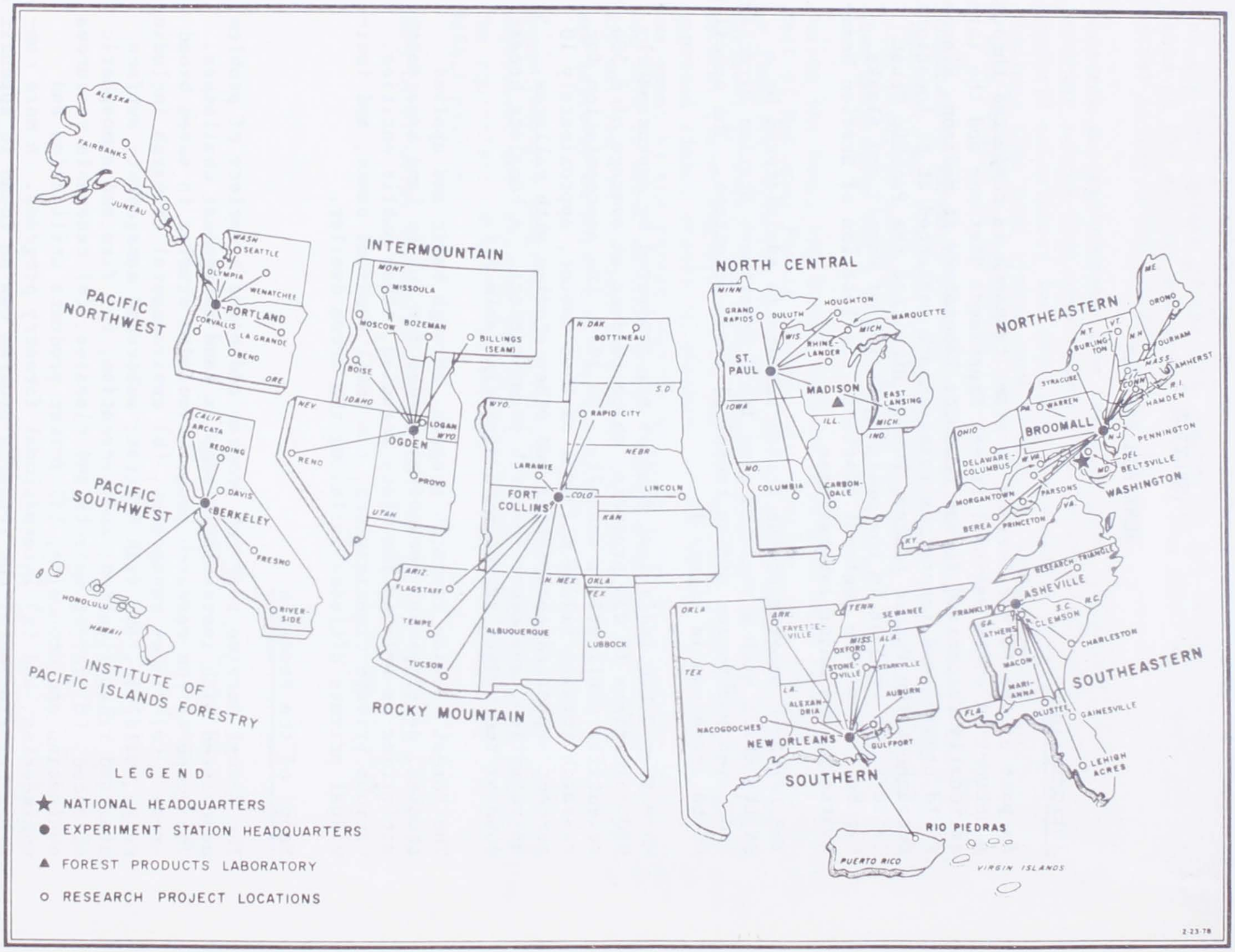


Figure 1.-- Forest and Range Experiment Stations of the U.S. Department of Agriculture

The basic unit for conducting research is the research work unit of which there are about 230. A unit operates under a work unit description (charter) for a period of 5 years. At the end of 5 years, the "charter" is either revised to accommodate the progress made in solving defined problems and to accommodate new high priority problems or it is terminated. A unit may also be revised or terminated prior to the end of the 5-year period for a number of reasons, including reductions in funding, inability to retain the highly trained professionals required, or a shift in research priorities.

On the average, 20 percent of the units are revised each year; however, it must also be recognized that for all units, including those not revised, numerous studies are initiated and completed each year. The publication of a manuscript relates to a significant finding, if not the completion of a specific study.

Relationship to Other National and Global Research

The Forest Service research program is generally regarded as the world's largest research organization providing scientific and technical knowledge necessary to protect the Nation's natural resources, gain maximum benefit from their use, and leave the environment unspoiled.

In 1975, it was estimated that funds spent on domestic forest and rangeland research programs totaled $217 million. This is relatively small when compared to the estimated expenditures of $23.6 billion for all research and development in 1975. The data show that more than half the forest and rangeland research is conducted by private industry. Almost 40 percent was conducted by the U.S. Department of Agriculture. The bulk of the USDA program is conducted by the Forest Service; however, funds obtained through McIntire-Stennis legislation for distribution to the forestry schools are included as programs administered by the Department's Cooperative Research division. Appendix figure 2 provides a more detailed breakdown of funding for forest and rangeland research. The estimate of research and development expenditures for forest and rangeland research abroad is not well defined.

Forest Service scientists maintain professional contact with colleagues throughout the world. Scientific exchanges, study, and research may be conducted for periods of a few weeks up to 3 years. Our International Forestry Program (described in appendix A) promotes the exchange of scientists, facilitates the implementation of technical assistance to developing nations, and allows for U.S. participation in pertinent international programs such as The Man and the Biosphere Program concerned with our global environment.

Research Planning and Coordination

Planning and conducting research programs jointly by the various cooperators promotes the efficient use of research talents and

facilities, as well as enhances the environment for conducting scientific investigations. Research program planning is part of the Resources Planning Act process, however, to incorporate the university resources into a coordinated planning effort, Forest Service Research, in conjunction with the 60 forestry schools and Cooperative Research of the Department, conducted a Regional and National Forest and Associated Rangeland Research planning effort during 1977 and 1978. This effort, which also involved more than 1,000 "users" of forestry research, led to publication of both National and regional plans to guide research for the next several years. These plans and the Department's regional and National planning system (authorized by the Joint Council which was established by the Food and Agriculture Act of 1977) forms an important framework for developing and carrying out a coordinated research program involving almost all publicly supported forest and rangeland research.

Another key vehicle for optimal use of research resources is extramural funding, wherein the Forest Service both provides and receives funds. In 1979, 459 cooperative agreements and 84 research grants totaling $8.75 million were undertaken with universities and colleges. In addition, 49 other cooperative agreements, grants, or contracts for $1.2 million were undertaken with noneducation research organizations. The total domestic extramural program for 1979 was $10.966 million. Details of the extramural program are shown in appendix table A 2.

In addition to funds allocated by the Forest Service for extramural research, the Forest Service is also the recipient of research funds. In 1979, over $4.4 million were received from Federal, State, and private sources to conduct research studies on subjects in which the Forest Service is recognized as having expertise. Appendix table A 3 shows the sources and amounts of these funds.

Funds provided the Forest Service by the Environmental Protection Agency (EPA) are a good example. The EPA is interested in accelerating ongoing research on surface mineland rehabilitation problems. This is an area in which the Forest Service has a long history of experience and is recognized as a leading authority. The additional funds have been made available to support activities of our Surface Environment and Mining (SEAM) program.

Summary of Research Accomplishments

New knowledge, increments to knowledge, and technology are the products of scientific investigations. Researchers document these findings in reports of various types. Documentation of these findings is essential for several reasons. Documenting publications are the primary and the lasting vehicle for transferring information from scientist to scientist, a must for communicating ideas, successes, and failures. Additionally, publications are a primary vehicle for transferring information to the user of research findings. Finally,

since the researcher is not primarily involved in technology transfer activities, his publications are vital to the agencies and Forest Service staffs charged with putting new technology into use.

The following table is a summary of the research accomplishments for 1979. It also includes comparative data for 1978. Appendix table A 4 provides a detailed subject area breakdown of the manuscripts published. Shortly after the first of the year, a bibiography of all publications, including highlights of the major accomplishments, is widely distributed to the research users so that they may obtain the most recent information of interest to them. The 1978 document included a 71-page bibliography.

Summary of Accomplishments

		1979
a. Number of manuscripts published, including those of a how-to-do-it nature.	(1,780) 1/	1,954
b. Number of documented uses of information resulting from formal consultations.	(1,331)	1,857
c. Number of management prescription guidelines accepted.	(272)	117
d. Number of new trees or shrubs bred and readied for use.	(4)	13
e. Number of prototype systems developed and tested.	(45)	74
f. Number of public patents awarded.	(12)	4
g. Number of official position papers, official reviews, or other official documents prepared.	(730)	599
h. Number of training documents prepared.	(147)	111
i. Number of computer models or programs placed in use.	(126)	134
j. Number of slide talks produced for distribution.	(59)	40
k. Number of films produced for distribution.	(6)	6
l. Number of workshops, symposia, or training sessions hosted.	(479)	691

1/ 1978 data in parentheses.

HIGHLIGHTS OF RESEARCH ACCOMPLISHMENTS

Examples of a cross-section of research accomplishments are included in the following pages. These highlights briefly describe the problem and the accomplishment as well as how the new knowledge or technology is being used. In many cases the lag time between technological development and adoption by the user is considerable. As a result, some of the accomplishments cited here can be expected to have their major impact in future years.

Fire and Atmospheric Sciences Research

Fire behavior can be predicted. Predicting fire behavior, once thought to be impossible, is now a reality. The development of a custom-programed micro chip for use with the Texas Instruments TI-59 handheld calculator has now made it possible for the fire manager to tell what a fire will do.

Research on this critical question has been underway for many years at the Northern Forest Fire Laboratory at Missoula, Montana. This research resulted in completion of mathematical models of fire behavior and fire danger that finally led to the development of the micro chip in 1979. The chip, when used with the TI-59, allows fire control personnel to calculate the National fire danger rating indexes to assess fire danger before a fire occurs. Perhaps more importantly, predictions of actual fire behavior from onsite assessment of fuels, weather, and topography can now be calculated. The fire managers in all Federal and most State forestry agencies are now using this important tool to determine fire severity in surface fuels and to determine when conditions reach that critical and dangerous state where fires can be expected to race destructively through forest tree crowns.

Appraising forest fuels. Each year roughly 115,000 wildfires burn over 2.4 million acres in the United States. Wildfires can be particularly troublesome when they burn in heavy fuel concentrations resulting from timber harvesting or thinning. One way to reduce wildfire hazard is by direct treatment of these fuels, but fuel treatment is expensive. The Forest Service alone spends $33 million annually for fuel management, and the costs are rapidly increasing. Consequently, land managers must choose the most cost-effective treatments.

Rocky Mountain Station scientists have developed a system that estimates the extent and severity of wildfire that can be expected under different fuel treatment strategies. Managers can use this estimate to help determine which fuel treatments, if any, should be used. The "Activity Fuel Appraisal System" combines fire and fuel modeling, historical fire and weather data, and principles of decision theory into an analysis that allows the land manager to consider wildfire occurrence risk, fuel quantities, climate, and suppression capability when evaluating fuel treatments. The system is currently being applied operationally by the Ashley National Forest in Utah and the Black Hills National Forest in South Dakota, by the Wyoming State

Office of the Bureau of Land Management, and by the Colorado State Forest Service.

Weather information for foresters. Forestry operations like prescribed burning, fire control, tree planting, use of heavy equipment, and nursery spraying are strongly influenced by weather conditions. Forest managers, therefore, have often asked for more information about the weather than they could get directly from the National Weather Service.

The need is especially acute for anyone who is trying to estimate the rate and pattern of smoke dispersion from a prescribed burn. Such an estimate requires data and computations that are best handled by a computer. An appropriate computer-based system was developed by researchers at Macon, Georgia. Since weather data had to be programed to predict smoke dispersion, the system was designed to provide additional weather information including localized forecasts, predictions about conditions for equipment and likelihood of rust infection in nurseries.

An evaluation of the Forestry Weather Interpretations System (FWIS) potential shows a 6:1 benefit/cost ratio. The grass roots experiment in which Georgia Forestry Commission personnel in 20 counties receive and relay County-level forecasts from FWIS also delivers important fire prevention and prescribed burning messages.

Mobilizing to prevent fires before they start. Forest Service researchers in California are involved in two efforts relating to the prevention of fires.

In cooperation with the Institute for Social Research, University of Michigan, Forest Service researchers developed a National Plan for Wildfire Prevention. More than 1,000 wildland fire prevention specialists and resource managers across the United States participated in a survey to identify research needs and their priorities. Subsequently, a series of workshops led to a plan containing recommendations for more than 500 studies of engineering and fuel modification problems, improvements in communications and education, and investigation and law enforcement. The National Plan will help make it possible to carry out a truly coordinated program of fire prevention research that will involve Federal agencies, all 50 States, and more than 30 colleges and universities.

In another effort, Forest Service researchers in California have developed mobilization procedures for fire prevention specialists, similar to those used for fire suppression crews. The prevention procedures, which are designed to reduce the number of man-caused fires in an area experiencing severe fire conditions, were first used in California in September 1979 during a period of extreme fire danger. Until recently, fire prevention specialists charged with trying to prevent fires from starting in the first place have not had these mobilization procedures or a strong network of support and immediately

available backup and assistance. Now, when large forest or wildland fires start in the United States, an interagency mobilization system can be used to dispatch quickly firefighters from all over the country.

Key to the prevention procedures is an up-to-date statistical summary that predicts the number of man-caused fires that are likely to start during a given day of the week. The fire occurrence forecast was used by the San Bernardino and Angeles National Forests, the California Department of Forestry, and the Los Angeles County Fire Department during the critical fire periods. The researchers coupled this summary information with an early alert to warn the National Forests and Ranger Districts when fire danger and occurrence probability would become high and mobilization of fire prevention specialists would have a high pay-off. The predictions and advance warnings enable fire prevention specialists to direct prevention efforts to specific fire causes--campfires, cigarette smoking, faulty vehicles or equipment--and specific locations where high probability of occurrence was forecast.

More than 80 fire prevention specialists from forests in Oregon and California and from the Bureau of Land Management were dispatched to southern California to carry out prevention patrols during the critical period. Test runs on two National Forests have demonstrated the beneficial potential of emergency prevention activity and established the basis for total mobilization of national fire prevention efforts.

Forest Insects and Diseases Research

Understanding and controlling the larch casebearer. Western larch forests of northern Idaho were silently invaded in the mid-1950's by a tiny moth called the larch casebearer. Nobody knows how the casebearer got to Idaho, but it was accidentally introduced into the Northeastern United States from Europe in the 1880's. Free of the parasites of its native Europe, the casebearers bred rapidly and spread over most of the western larch type in Northwestern United States and British Columbia.

Concern over the consequences of repeated defoliation prompted the Forest Service to inititate research soon after discovery of the casebearer near St. Maries, Idaho, in 1975. The results of this research were recently published in "Larch Casebearer in Western Larch Forests." As is pointed out in the publication, emphasis was given to research on biological control using small parasitic wasps that are native to the casebearer's homeland. In 1960, the first of several species of these wasps was imported and hundreds of thousands have been released in many infested stands. It has also been discovered that there are now local parasites that have begun to feed on the casebearer.

Because it appeared that casebearer numbers might have to be reduced in order to give the wasps an upper hand, two insecticides were tested and found to be effective. Their use, however, has not been required

because of the marked reduction in severity of defoliation in the past decade. Triggered by droughts in 1967 and 1973, casebearers were decimated in their vulnerable needlemining stage. This apparently was enough to set in motion a complex of controlling factors in which parasites were of primary importance.

The new comprehensive publication on the larch casebearer contains a wealth of information on recognition of casebearer life stages, biology, damage symptoms, and methods of evaluating outbreaks. The information in this publication will be useful to private, State, and Federal forest resource managers in the States of Montana, Idaho, Oregon, and Washington where western larch is an important component of the forest stand. It will also be valuable to students and working professionals interested in the larch casebearer problem.

Biological control developed for pine shoot borer. A biological strategy has been developed to control the western pine shoot borer with an artificial version of the insect's own sex attractant or pheromone. Cooperative research by the Forest Service and Weyerhaeuser Company has shown that the sex attractant--when applied in amounts slightly greater than occur naturally--can be used to confuse male moths and prevent them from finding females. Reproduction is blocked, shoot borer populations decline, and damage to pine plantations is reduced.

The shoot borer is a pest of ponderosa pine and jeffrey pine plantations throughout the Western United States where growth reduction is estimated at $200 per acre. The larvae mine inside the new terminal shoots where they cannot be readily treated with insecticides. Practical methods for both aerial and ground application of the pheromone have been developed. Once the pheromone is registered for commercial use, control of insect damage should be possible at a very low cost. A single treatment of less than 1/4 ounce per acre reduced damage from 70 to 90 percent.

Pheromone control is now recognized as a means of pest management that avoids the use of chemicals potentially harmful to the environment. The attractant is highly specific for the shoot borer and is not toxic to humans or other organisms.

This is the first case in which a pheromone control strategy has been shown to reduce damage by a forest pest and one of the first such successes in either agriculture or forestry. The Forest Service has done extensive work on insect pheromones. Work continues at various stages to identify and develop attractants for pest management of the western spruce budworm, the Douglas-fir tussock moth, and the black-headed budworm.

Once the pheromone is registered for commercial use, this technology will be useful to major industrial and Government timberland managers for protecting ponderosa pine. It will be particularly useful to landowners such as Weyerhaeuser Company for pine plantations in the West Coast and Pacific Northwest States.

Spruce budworms management. The Canada/United States Spruce Budworm Program (CANUSA) is a joint international effort with the Canadian Forestry Service to develop effective spruce budworm and forest management techniques. CANUSA has completed its first year of activity with full funding. A considerable number of research proposals, cooperative agreements or contracts were funded to support activities ranging from basic biological studies to the development of a comprehensive integrated pest management plan. The geographic distribution of investigators ranges from Maine to California and from the Lake States to Georgia, and also includes several Canadian Provinces. These investigators represent U.S. and Canadian universities, USDA Forest Service and Canadian Forestry Service units, private contractors, and private timber companies.

In the first field season, some promising results are developing in the following areas: monitoring of spruce budworm populations with pheromones, automatic egg mass counters, damage and hazard rating techniques, environmental impact and assessment of chemical insecticides, improved application technology for chemical and biological insecticides, and appraisal of presalvage strategy for budworm management. In addition, the program supports an integrated pest management demonstration in Maine aimed at reducing budworm damage by developing specific management plans for specific tracts that use silvicultural treatments, harvesting, and more precise spray application. This is a joint effort with the University of Maine, several private timber companies and Baxter State Park in Maine.

Diseases of pacific coast conifers. Forest Service plant pathologists, with the assistance of others in State, county, and university organizations as well as the Canadian Forestry Service, have developed a major USDA Handbook that provides basic information needed to identify the common diseases of Pacific Coast conifers. This handbook describes hosts, distribution, damage, disease cycle, and identifying characteristics for 31 needle diseases; 17 canker, dieback, and gall diseases; 23 rusts; 8 root diseases; 15 forms of mistletoe; and 18 forms of rot. Diseases in which environmental conditions are contributory factors are also described. Also included are: color and black-and-white illustrations, a descriptive key to field identification for each major group of diseases, a glossary, and host plant and disease causal agent indexes. Except for a number of texts written on forest and plant pathology, most of the available literature was in the form of bulletins, monographs, articles, and shorter contributions issued from time to time through a variety of publication outlets.

This handbook now brings all the basic information together under one cover. It will be useful to a broad group of laypersons and professionals interested in such activities as resource management, conservation, forestry, tree farming, outdoor recreation, and growing ornamental trees. Although primarily of value to persons interested in conifer diseases found in the Pacific Coast States, this handbook

will also be an invaluable aid to students, laypersons, and professionals throughout Western North America.

Renewable Resources Evaluation Research

Improved scientific information and analytical techniques developed for use in the 1980 Renewable Resources Assessment. The Forest and Rangeland Renewable Planning Act (RPA) of 1974 as amended by the National Forest Management Act of 1976 directs the Secretary of Agriculture to prepare periodical reports to the Congress on the Nation's renewable natural resources. The Renewable Resources Assessment is a supporting technical document for these reports on renewable resources. The second assessment prepared in response to this legislation will be submitted to the Congress in early 1980. The major findings of the Assessment are that, while trends in the consumption of most forest and rangeland related goods and services show that future demands may well outstrip future supplies, there are many opportunities for remedial management programs to prevent such future shortfalls.

In preparing the 1980 Assessment, new scientific information, resource data, and analytical methodologies were developed by Forest Service scientists at various locations throughout the country. For instance, a pilot study in South Carolina of new inventory techniques for obtaining needed information on all relevant forest-related goods and services was completed by the Southeastern Forest Experiment Station. Other examples include the development of a regional supply/demand equilibrium model, a comprehensive study of the costs and financial benefits for timber management practices, and new surveys of wood product consumption in the major end-use sectors of the national economy. These and other studies by Forest Service economists and analysts have provided new scientific information and data for use in the 1980 Assessment. In spite of this progress, the pace of change and complexity of interactions in the management and use of renewable natural resources will require both better scientific information and improved analytical methodologies in the future. Forest Service scientists will continue work toward improving both the scientific data base and analysis techniques needed for the preparation of future renewable resources assessments.

New concepts in multiresource inventory. The new forest inventory of South Carolina is the most comprehensive State multiresource inventory ever completed. In 1976, South Carolina was selected as one of the six pilot study areas in the United States to be highlighted in the 1980 RPA Assessment. The specific mission in South Carolina was to develop and test procedures for multiresource inventories. Scientists in the Southeast had been involved in a number of innovative nontimber resource studies and had formulated new concepts of the additional inventory needs.

Previous inventories focused primarily on timber. While they provided the official estimates of total forest acreage, detailed

classifications and measurements were generally confined to lands classified as commercial timberland. The new inventory for South Carolina will allow foresters, range specialists, wildlife biologists, recreation specialists, ecologists, and others to draw upon a common data base.

It should provide an understanding of the ecological relationships that affect resource benefits when land is used for several purposes simultaneously.

As experience is gained in analysis of multiresource inventory data, procedures will be improved and incorporated into operational inventories in other States. The inventories, by State, are updated periodically to meet the growing need for improved resource base data.

Forest resource inventory provides biomass for energy data. The Nationwide inventory and analysis of renewable forestland resources was initiated at the direction of the McSweeny-McNary Act of 1928 and continues under the authority of the Forest and Rangeland Renewable Resources Planning Act of 1974 and the Forest and Rangeland Renewable Resources Research Act of 1978. State-by-State inventories were conducted on nearly 50 million acres of forestland this year. Analysis and publication of these resource data provided the sound technical information base required for resource decisions and policy at multi-county, State, regional, and national levels. In addition to providing forest area and productivity data to the public and the various forest-related industries, several specific applications were made of these resource inventories for the evaluation of alternative energy sources. For instance, biomass data by forest condition, utilization category, and forest region were developed in the State of Maryland. This information was used in a legislatively mandated study of alternative fuel sources for State institutions. Similar evaluations have been made in New England, the South and the mid-West. Their application has included the identification of alternative power generation potential, commercial and institutional heat/power cogeneration potential, and residential fuelwood availability.

Renewable Resources Economics Research

Development of methodologies for analyzing significant policy issues. The issue of setting aside large additional areas of the National Forest System as wilderness areas has generated much controversy between proponents and opponents. The respective benefits and impacts of alternatives courses of action with respect to this issue were the subject of close examination during the recent second Roadless Area Review and Evaluation (RARE II).

One facet of the debate over allocating large additions of presently unroaded portions of the National Forests to wilderness designation is the hypothesis that as much timber could be harvested, without logging within the roadless areas, if the monies saved by not building roads were to intensify management on the remaining forest lands.

Researchers at the Pacific Northwest Forest and Range Experiment Station developed an analytical method and tested this hypothesis in seven western National Forests. Their conclusions were that, because of environmental constraints, to increase timber management and harvesting significantly on the lands outside the roadless areas, there were limited opportunities to intensify management through increased investments in intensive management of accessible areas. Since the seven Forests were not construed to be a scientific sample, no firm conclusions on this issue can be drawn for other National Forests in the West. However, the study does suggest that there may be similar limitations for other western National Forests and that the issue of increasing management intensity on accessible areas is complex and extends beyond questions of available monies alone.

Another important issue associated with the second Roadless Area Review and Evaluation has been the likely impact of massive withdrawals of unroaded National Forest land from future timber harvesting on future wood product output and prices. Forest Service Research economists at the Pacific Northwest Station developed methodologies and analyzed the potential effects of withdrawing all roadless areas that were being studied. Their conclusions were that while there could be severe impacts on local and subregional economics in the West, the overall long-term effect would be to increase softwood timber harvesting in other parts of the country and also to stimulate greatly increased imports of Canadian softwood lumber. Price increases for softwood lumber would occur, but these increases would be moderated by likely expansion of Canadian lumber imports.

These studies illustrate the contribution made by Forest Service research in providing a factual basis for the resolution of complicated issues in the management and use of forests and forest-related resources.

Timber and wood products business data and market information source book developed. Forest Service market analysts at the North Central Forest Experiment Station and at the Forest Products Laboratory jointly developed a reference source book of key business data and market information on timber and wood products. The book contains comprehensive listings for source of timber and wood products-related data including economic statistics, directories, forest products reports and newsletters, price reports, pertinent periodicals, bibliographies, computerized information retrieval systems, and many other market information aids. This book now serves as a valuable reference and information source for timberland owners, small private wood processors, and others involved in the production, sale, and marketing of timber and wood products.

Surface Environment and Mining Research

Revegetating surface mine spoils in the West. Almost three-quarters of the Nation's coal reserves are located on Federally administered

lands in the West. Oil shale, another important source for future supplies of energy, also occupies vast areas of the Intermountain West. As development of these resources progresses, a key problem has been how to revegetate surface mine spoils with the objective of controlling erosion, enhancing aesthetics, and restoring the land to productive use.

Forest Service scientists, in cooperation with the Environmental Protection Agency, industry, the Bureau of Land Management, and State universities have made several significant contributions to mineland revegetation.

A minicomputer-based planning system to evaluate mine plans, reclamation strategies and environmental impacts for use by the specialist/operator enables him to quickly and objectively evaluate data to determine reclamation techniques and the most feasible post mineland use. In the arid Southwest, researchers have been successful in establishing plant growth that is both practical and feasible. Current work is with native and introduced plant species and improving the potential for rehabilitation by inoculating mine spoils with mycorrhizae and developing typographic shaping for "water harvesting" to revegetate difficult sites. Specific guidelines for use by industry and resource management agencies for revegetating spoil materials on coal fields of central and southern Utah have also been developed.

Revegetating surface mine spoils in the East. Revegetation of surface mine spoils in the East is important for controlling erosion, enhancing aesthetics, and restoring the land to productive use. The planting of compatible combinations of species will produce a quickly established ground cover and a permanent or long-lived cover and product. Vegetation of steep slopes and toxic spoils often requires the application of soil amendments, planting of acid-tolerant species, and introduction of beneficial micro-organisms.

Research on the various species of micro-organisms that are known to form mutually beneficial associations with plant roots shows the importance of these organisms in establishing good vegetation on mine spoils. Preliminary observations indicate that hardwood bark and woodchips also have promise as mulch materials used in establishing vegetation on surface-mined lands.

A manual for revegetation of mined lands in Eastern United States is nearing completion. It will cover selection of species for quick cover to control erosion, selection of permanent species for long-term cover, and techniques for sampling and evaluating mine soils to guide selection of appropriate plant species and needed amendments. A second manual has been published which will aid land managers, landowners, and mine operators in revegetating surface-mined areas for wildlife in eastern Kentucky and West Virginia.

Urban sewage used for reclamation and short-rotation tree culture. American cities are producing huge volumes of sewage and many of them are running out of places to put it. Forest Service scientists are determining that the millions of acres of land disturbed by strip mining, severe erosion, and borrow pits can utilize sewage sludge to restore the productivity of the soil. One study in the Copper Basin in eastern Tennessee contributed to this conclusion. Severely disturbed and eroded sites in the area have defied reclamation for many years, but applications of sewage sludge prior to planting of pines has greatly increased seedling growth. On a borrow pit in South Carolina, loblolly pine growth during the critical first 3 years after planting was increased 20-fold by applying 1/2 inch of sewage sludge prior to planting. This comparison was not even with a completely untreated site, but with plots where 500 pounds per acre of 10-10-10 fertilizer and 2,000 pounds per acre of lime had been applied. Sewage sludge is far more effective than commerical fertilizer and lime for such reclamation. This research provides land managers with an energy conserving method whereby a waste product is used to rehabilitate and protect disturbed sites and convert them into fast growing tree plantations.

In Michigan, forest vegetation has been used to remove large amounts of nitrogen contained in wastewater from sewage oxidation ponds. Short-rotation tree culture appears to have a promising role in the design and operation of land treatment systems. This system can improve several environmental problems--disposal of sewage, production of wood fiber for products and energy, and reduction in the land needed for disposal of wastewater.

Trees and Timber Management Research

Energy and nitrogen from red alder. Red alder is the major hardwood species in the Pacific Northwest where it has the reputation as a successful, but often unwelcome, competitor of conifers. Now researchers at the PNW Station are suggesting that forest managers begin to consider alder in their management plans.

There are many reasons for this. Alder is fast growing, outstripping associated conifers for the first 30 years. Its wood is suitable for many commercial products; it is a prime fuelwood. Alder is widely available; it covers a large portion of the low-elevation coastal forest area from Alaska to Central California. In addition, red alder is the only important western tree species that adds nitrogen to the soil at the same time it produces usable wood.

Alder can be planted by itself for short rotations to produce fiber for pulp or fuel or it can be managed on longer rotations to produce solid wood products. Alder can be planted in mixtures or in alternating rotations with other species, an important consideration in maintaining favorable nitrogen supplies. Alder also has potential for use in reclaiming strip mine sites or areas where diseases now prevent conifers from growing.

Costs and benefits of growing alder in alternate rotations with Douglas-fir were estimated and compared with conventional management of Douglas-fir. Six different management regimes were evaluated and found profitable, although not as profitable as systems with Douglas-fir alone. However, these rankings will shift as future costs and prices vary. Although a perpetual series of rotations was assumed, it is not known whether rotations of Douglas-fir alone could be produced indefinitely without adding nitrogen.

Much information on the use and management of alder has been made available this past year. With the University of Washington, the Forest Service cosponsored the Conference on Management and Utilization of Alder and published a 380-page proceedings. This state-of-the-knowledge report will be of considerable use to foresters, scientists, and land managers throughout the Pacific Northwest in planning future research and in managing the alder resource.

Container-grown seedlings speed reforestation. Ten years ago practically all tree seedlings were grown outdoors and shipped bare-root to the planting site. To be successful, bare-root seedlings must be of adequate size (usually 2-3 years old in the West). They must be lifted only when completely dormant, kept in cold storage, and planted only at the most favorable time of year. Hence, flexibility is limited.

Over the last decade, it has been have found that seedlings grown in containers do not have these limitations. Because the root system is intact and protected, cold storage is usually not necessary, and seedlings can be planted successfully over a longer planting season. When grown in a specially designed greenhouse-type structure, container seedlings can be programed for planting at almost any time of year. Under this controlled environment, seedlings can be produced in one-fourth the time needed in outdoor beds, allowing nurserymen to respond quickly to changed logging schedules or for replanting after large fires.

Extensive research into all aspects of seedling physiology, nursery hardware, and planting techniques have made possible the current North American production of more than 100 million container seedlings per year.

The research and practical experience of many scientists and nurserymen has recently been assembled in a manual entitled "How to Grow Tree Seedlings in Containers in Greenhouses." This how-to-do-it manual will be an invaluable information source for forest industries, landowners, nurserymen, and even private entrepreneurs who are interested in growing containerized seedlings for their own use or resale.

Radiography advances tree seed technology. Radiography provides a practical method for seed analysts to evaluate internal seed anatomy without destroying the seed. Radiography enables detailed determination of seed structure, development, mechanical injury, and insect damage. Coupled with other accepted tests, radiography helps researchers draw

accurate inferences about seed quality. The method can be safely incorporated into laboratory procedures because the energy necessary to penetrate seed is relatively low in the X-ray range, and adequately shielded equipment is now available.

Researchers and seed analysts of State and Private Forestry have developed a handbook to familiarize seed radiography users with materials, equipment, techniques, and terminology involved in preparing and interpreting radiographic imagery. The handbook reviews routine features of the process and discusses new and emerging aspects.

Research recently completed at the Southern Station has expanded the potential of radiography for tree seed evaluation. Twenty-four radiopaque agents were assessed for capacity to promote image contract needed for accurate interpretation. With black walnut, shellbark hickory, and pecan seeds serving as test subjects, 20 of the agents improved images of either seedcoat cracks, cavity outlines, healthy tissue, damaged tissue, or general contrast. Results presented in tabular form allow analysts to select readily the agent best suited for enhancing the image of a specific characteristic. Nurserymen, land managers, and landowners will be the benefactors of this research because it will eventually lead to higher quality seed for producing reforestation stock.

Tree breeding strategies using multiple populations. Quantitative genetics is a highly specialized field on the border between mathematics and genetics. Workers in this field explore the complex problems associated with breeding designs and strategies inherent in long-term breeding programs for improvement of multiple traits. Traits that are likely to be valuable far into the future must be selected; and breeding patterns must be chosen that will permit reasonably rapid gains in early generations without sacrificing the genetic variability that permits gains in distant generations.

A system of tree breeding using multiple populations has been shown to be feasible. By dividing breeding populations into subunits, a greater genetic gain can be achieved than by using a single breeding population of comparable size. When the future is uncertain, as it generally is in forestry because of the long generational span, selection for different trait combinations or site conditions can be undertaken simultaneously by selecting for different responses among the subunits. Using this approach, tree breeders, tree improvement specialists, and seed orchard managers can deploy multiple populations in several directions around genetic combinations of high predicted future value. This practice will allow high immediate genetic improvement, guard against selection of improper direction, and provide genetic flexibility and variation in the breeding population for many generations in the future.

Guides for management of western hemlock-Sitka spruce forests for timber production. The western hemlock-Sitka spruce forest type occupies a narrow 2,000-mile strip along the Pacific Coast from Oregon

to Alaska. The type is extremely productive; it accounts for a substantial part of the timber harvest in Western Washington and coastal British Columbia, and nearly all of the timber harvested in Alaska.

In addition to their value for timber, hemlock-spruce forests provide habitat for wildlife, and forest streams provide spawning and rearing habitat for salmon and trout that sustain an important commercial sport fishery. The forest also provides scenic and recreational opportunities for many people.

Over the years, a great deal of research has been done toward understanding the hemlock-spruce forest ecosystem. Much practical experience has been gained toward management of these forests. Forest Service silviculturists recently reviewed the literature and obtained firsthand local information on current practices from land managers in the field.

The result is a report describing current timber management practices with practical guides for management throughout the type. The scientific basis for management is also well-documented for those wishing more detailed information. Although the emphasis is on providing foresters and land managers with better guides for timber production, consideration has been given to site protection and nontimber values as well.

Forest fertilization and water quality. Research at the Pacific Southwest Experiment Station has demonstrated that timber growth can be doubled on certain sites through proper application of nitrogen fertilizers, without risk of contaminating groundwater with nitrate. Scientists at Redding, California, have established a battery of studies in four geomorphic provinces in the State to determine not only the benefits of fertilization on timber growth, but also the effect on water quality.

Nitrates are normally present in low amounts in undisturbed forest soils, regardless of depth. The results of the studies have shown that when nitrogen was applied at rates as high as 400 pounds per acre, the nitrate concentrations were still relatively low (approximately comparable to the natural concentrations) at a depth of 1 meter below the soil surface. This depth is well above the surface of the permanent water table in the four test provinces.

The fertilizers were generally applied in the fall. When the soil warmed in the spring, the nitrate concentrations tended to intensify in the upper layers of the soil profile, but the tree roots also became more active and effectively absorbed much of the nitrate before it filtered to more critical depths.

According to the U.S. Public Health Service, drinking water that contains 10 milligrams of NO_3-N per liter (62 milligrams of nitrate) is hazardous. Solution samples taken from various soil depths showed that, although nitrate concentrations at a 10-centimeter soil depth

frequently exceeded the Public Health Service limits, the concentrations fell well below the limits at depths of 50 centimeters and were comparable to "natural concentrations" at depths of 1 meter.

When the higher concentrations were found, they were generally from sites with poorly developed, coarse-textured soils. The studies have shown, however, that even in these coarse-textured soils, the nitrate concentrations fell below the critical level in a few days.

Scientists are working on techniques to determine exactly what biological, ecological, and economic returns can be expected from treating forest soils with fertilizer. These techniques will help identify forests that will be responsive to treatment and are growing on well-developed soils that will not permit nitrate to filter into the water table.

The techniques and analyses will be used by forest researchers to produce guidelines or prescriptions for fertilization programs that will increase timber productivity without jeopardizing water quality.

Yellow-poplar timber growth two-and-one-half times greater than harvest. The rate of harvest of yellow-poplar timber in the Eastern United States can be doubled. The significance of this finding is that yellow-poplar can be used to manufacture many products now made from pine. For example, rough construction plywood, many kinds of paper products, studs, and sheathing for housing can be manufactured from yellow-poplar and help relieve the pressures now being exerted on the southern pine resources.

There is no need for intensive management of yellow-poplar to bring about these increased supplies. Custodial management--permitting a forest to regenerate and grow as it will and harvesting timber at the landowner's convenience--is responsible for the current rate of yellow-poplar growth. At the time of harvest and regeneration, there is no need for large investments that must be carried forward at high rates of interest for 40 to 80 years. The minimum cultural practices for yellow-poplar management are: (1) Keep harvested areas larger than about 1 acre, (2) remove or fell all trees larger than 2 inches in diameter at the time of harvest, (3) protect the young stand from fire, and (4) schedule the next harvest according to the owner's best interest. These guidelines will be of interest to land managers and landowners throughout the central and southern Appalachian forest region where yellow-poplar predominates as a commercially important timber producing tree.

Root parasites of southern forests. Root parasites were virtually unknown to southern foresters until 1969 when a Southern Station scientist reported that a root parasite (Senna Seymeria) was killing 3- and 4-year-old slash pines in a large plantation in northwest Florida. Since then, a comprehensive series of studies has identified the significance of southern root parasites as pathogens of both pine

and hardwood species. These studies were a cooperative undertaking between Old Dominion University in Virginia and the Forest Service.

Perhaps the most familiar parasitic plants are the mistletoes that penetrate stems and branches of trees and shrubs. Root parasites act similarly below ground, forming specialized knob-like organs (called haustoria) that attach to and penetrate roots of neighboring plants to provide a pathway for the transfer of water and food from the host to the parasites. These parasites depend on host plants for subsistence in varying degrees. Several species are capable of maturing and producing seed without attachment to a host. Some parasites attach to a wide variety of hosts, while others are much more specific.

This research is reported in a field guide that can be used by professionals and laypersons alike and gives geographic range, host selection, habitats, keys for identification, and color photographs of the most prevalent southern root parasites.

Forest Watershed Management Research Increasing water yield. Water yields can be increased by modifying vegetation to reduce transpiration and by trapping blowing snow to reduce evaporation and sublimation. According to scientists at the Rocky Mountain Station in Tempe, Arizona, annual flow of the Colorado River could be increased up to 6 million acre-feet if all contributing forest and brush lands were managed solely to increase water yields. Such dramatic increases could not be achieved, of course, without serious impacts on other current forest resource, economic, social, and environmental values.

Water yields in the upper Colorado River Basin could be increased an estimated 500,000 acre-feet by appropriate management of about one-fifth of each major vegetation type. About half of that increase would come from subalpine forests, where welldesigned timber harvests would create small forest openings to trap blowing snow. More extensive treatments would be necessary to get an additional 250,000 acre-feet annually in the lower basin. About 90 percent of the increase would be generated by creating a mosaic of grassy openings in about one-fifth of the chaparral, and intensive management of a third of the ponderosa pine.

In addition to increasing water yield, this type of management could also substantially increase yields of timber and forage for livestock and improve landscape esthetics, recreation opportunities, and habitat for many species of game and nongame wildlife. The research leading to these conclusions is being consolidated in one state-of-the-art publication, which is expected to have widespread use and influence.

Assessing the impact of weather modification in the Sierra Nevada. In cooperation with the Water and Power Resource Service, hydrologists at the Pacific Southwest Station have produced a set of nine reports that can be used to evaluate the effect of wintertime weather

The impacts of increased precipitation on five major ecological areas were estimated from historic snowpack and precipitation data acquired from 1899 through 1974. The estimates covered potential impact on: (1) Vegetation, including rare and endangered plants; (2) forest insects and diseases; (3) deer and their habitat; (4) nonpoint source pollution; and (5) lake and stream biota.

The reports include a bibliography of more than 1,800 citations relating to the impact of weather modification and an overview in which responses to public concerns are evaluated.

The reports can be used to evaluate environmental impact statements, to implement such statements; or to assess the utility of weather modification on flood potential, nonpoint source pollution, and reduction of drought stress on plants and animals. Findings are being used by National Forest Systems to judge the impact of weather modification in forest ecosystems. The Bureau of Reclamation, Weather Modification Division, is using the study results to assist in determination of modification designs that will prevent damage to the environment. National Forest Systems utilize the data in planning harvest cuts to increase low flows and decrease flood flows.

Roots enhance soil strength. Hydrologists and soil scientists at the Pacific Southwest Experiment Station's Redwood Sciences Laboratory, Arcata, California, are learning how logging affects the role that roots play in maintaining slope stability in the unstable landscape of Northwestern California. They found that both tree and brush roots reinforce unstable slopes by tying the soil mantle to parent material and by providing lateral support to the soil mass.

In their initial efforts, they weighed, measured, and grouped into size classes thousands of roots excavated from unstable sites in Northwestern California, Oregon, and Alaska. They then tested the roots for shear strength to determine their ability to resist the stresses continually acting on the unstable slopes. On some sites, they measured the shear strength of the soil-root matrix on portable equipment they developed for use at the excavation sites.

The data obtained in these studies helped interpret the interaction of timber harvesting activities and mass erosion processes, such as landslides, soil creep, and debris avalanches. On clearcut blocks in mixed conifer forests, they found that about one-half of the roots less than 17 millimeter in diameter had decayed within 3 years and more than two-thirds of the roots were gone within 7 years, which meant the root biomass within that important size class has only 10 percent of the holding capacity it had before logging.

The studies also indicate that invasion by brush may not be undesirable from the standpoint of soil and slope stability. Within 12 years after logging, the cutblocks were completely revegetated with snowbrush (Ceanothus velutinus), rather than conifers. Although the rootmass of brush is only about half that of conifers, the individual roots are twice as strong as conifer roots. Thus, the brushfields will add equal reinforcement to the slopes to that provided by the conifer roots.

These findings provide important guidelines for managers of forests in the Coast Range and Klamath Mountains of Northwestern California. The area provides more than 40 percent of California's timber products, 37 percent of its streamflow, and is the most valuable habitat for anadromous fish in the State. Findings have resulted in the modification of timber harvest plans by the Forest Service on the Rogue River, Sawtooth, Shasta-Trinity, Siuslaw and Tongass National

Although there is much to be learned about the interaction of logging activities and mass erosion processes, the root-strength studies point up the importance of establishing a new stand as soon as possible after harvesting.

More water means more antelope. We could have more antelope on Great Basin desert lands. Researchers of the Intermountain Forest and Range Experiment Station and the Utah Division of Wildlife Resources have just completed a series of studies that show that the poor distribution of the few existing watering places is the major reason why antelope do not occupy much of the potential range otherwise suitable for them. Both the topography and the forage are there; but, unfortunately, the water is not. The development of additional watering places is the key to expanding antelope range.

How much water and how it is used have been carefully documented in these studies. Researchers have demonstrated, for example, that making more watering sites available during fawning season helps distribute the antelope population and thus may lessen the number of fawns killed by predators. Predation is one of the major contributors to the slow rate of antelope population growth.

The results of the research are being applied by the State of Utah which is constructing an increasing the number of rainwater catchments and other water developments on potential antelope range. Similar water developments on cold-desert areas of Nevada, Eastern Oregon, and Southern Idaho could greatly increase antelope populations throughout the Intermountain West.

Wildlife, Range and Fish Habitat Research

Wildlife habitats in managed forests. Forest managers throughout the country are beginning to use a new system to improve habitat for wildlife in managed forests. The system will enable forest managers to respond to recent legislation concerning wildlife needs and to manage forests more effectively for both timber and wildlife uses.

The system was developed by researchers at the Pacific Northwest Station in cooperation with the Wildlife Management Institute, the U.S. Department of Interior's Bureau of Land Management, the National Forest System, and State fish and game departments. It grew out of the need to protect wildlife habitat in Eastern Oregon and Washington when salvaging large amounts of timber damaged by a major outbreak of the Douglas-fir tussock moth in 1972 to 1974. Guidelines developed management. The system was initially developed for use in the Blue

Mountains of Oregon and Washington, but it is generally applicable to managed forests throughout the United States.

The new system is now being used to improve wildlife habitat management in National Forests in the Pacific Northwest, California, and the Intermountain West. Application by Federal, State, and private forestry managers across the country is expected following publication of the work as Agriculture Handbook No. 553, "Wildlife Habitats in Managed Forest--the Blue Mountains in Oregon and Washington."

Guides for assessment of California wildlife needs. Managers of National Forests in the Pacific Southwest Region, along with their colleagues in other regions, are responsible for providing habitat suitable for maintaining an abundance and diversity of wildlife species. Legislation such as the National Forest Management Act, and Forest Service policy as well, requires that forest management plans take into consideration the different needs of all forest wildlife. These requirements pose a formidable assignment--a single National Forest may contain hundreds of different kinds of wildlife. Forest managers must be able to determine how each of these species might be affected by proposed land management activities.

In order to help land managers meet this responsibility, Researchers and the Staff of the Pacific Southwest Region have produced a data base about 355 species of wildlife in the Western Sierra Nevada. This new data base is available both as a written report and in a format suitable for computer access and analyses from the Region's wildlife management staff in San Francisco.

For each of the birds, mammals, reptiles, and amphibians described in the Report, information about the life history, distribution, and habitat needs is presented, along with a sketch of the species and a map of its distribution. Perhaps the most important feature of the data base is the species-habitat matrix, which depicts the plant communities each wildlife species needs at different times of the year for breeding, resting, and feeding. It further shows how this use changes with successional changes in vegetative cover.

The Report is the only one of its kind on California wildlife and was carefully designed to be a convenient, easy-to-use field reference. In its computerized form, it was similarly designed for quick access to and analyses of the best information currently available on wildlife habitat needs. Both the publication and the computerized data base offer California wildlife biologists, silviculturists, and others an invaluable aid for determining possible impacts that timber harvesting, prescribed burning, roadbuilding, and similar forest management activities might have on their forest's wildlife. The data base is currently being used by the Plumas, Eldorado, and Sierra National Forests for timber sale assessment and land mangement planning.

The parrots of Luquillo are increasing. Human intrusion into the tropical forests is jeopardizing the habitat of thousands of animal species. Only 13 Puerto Rican parrots were living in 1974, but research on this endangered tropical bird has helped increase the number to over 30 in the wild in 1979. Cooperative research between the Forest Service and the Fish and Wildlife Service led to development of nesting structures that frustrate predators such as the pearly-eyed thrasher and rats. There are presently four active wild nests and three other pairs of parrots should be nesting within the next 2 years.

Several important breakthoughs in the past 2 years suggest that revival of Puerto Rican parrots is only a matter of time. Scientists can now sex the parrots by analyzing stool samples and can select compatible mates for captive breeding by watching the habits of individual caged birds. Hispaniolan parrots from the Dominican Republic make excellent foster parents. They have been successfully used to hatch Puerto Rican parrot eggs and raise nestlings. Then, before fledging, these fostered birds can be transferred to active Puerto Rican parrot nests. This technique can ensure that each active wild nest fledges a maximum brood of three to four birds.

Research will continue until the population has been built to 200 nesting pairs and nesting sites are established in two or more different locations in Puerto Rico. Management of the species will then be turned over to action agencies on the island. The progress of this research is shown in a 23-minute color film titled, "The Parrots of Luquillo."

Forest Recreation Research

Measuring the benefits of outdoor recreation. Because most publicly provided outdoor recreation opportunities have not been allocated by competitive market prices, there has not been a great deal of concern for evaluating the benefits recreationists receive. But as planning activities have increased and resource demands grow, the need to measure recreation benefits has grown too. For this reason, researchers at the Rocky Mountain Station have been attempting to get better measures of both the economic and noneconomic benefits of outdoor recreation.

Survey research techniques have been developed to identify the reasons why different types of outdoor recreationists decide to participate in particular activites and to quantify the kind and level of benefits they feel they derive from participation.

The research has led to the development of an outdoor recreation opportunity resource inventory and mangement system. The system can be used to map public lands to show which areas can best be managed to provide specific types of recreation opportunities. The system has been adopted nationwide by the Forest Service and the Bureau of Land Management and is being incorporated into all land management planning where outdoor recreation is of concern.

Managing wilderness--the American dilemma. Although it seems like a contradiction, wilderness must be managed. This is the premise of a recently published book titled Wilderness Management. The authors point out that, although wilderness is intended to be natural and unmodified, increasing recreational use and other influences make it necessary to manage these areas in order to protect the natural values for which they were established.

The book Wilderness Management summarizes the history of wilderness as a land use, discusses the legislation protecting wilderness, and describes current use patterns and pressures. The book shows how research knowledge can be utilized in the wilderness management planning process. It covers both management of visitor use and resource protection and the relations between the two. It also provides a basis for developing visitor management programs with as little regulation and restriction as possible while safeguarding wilderness quality.

The book has already been adopted in many university classrooms and is used as a standard reference by wilderness managers in all Federal land management agencies. The information, concepts, and planning frameworks described in the book will help promote quality management of America's remaining wilderness lands.

Assessing how rivers are used for recreation and why. Recreational use of our Nation's waterways has grown tremendously during the past decade. Managers of Federal, State, and local rivers are being forced to deal with problems such as conflicts among user groups, depreciative behavior, crowding, and environmental impacts. To deal with these problems, and to be adequately prepared to developing sound management plans, managers need cost efficient mechanisms to ascertain quickly how river recreationists view management problems and their solutions.
River recreation research headquartered in St. Paul, Minnesota, in collaboration with Federal and State land management agencies, has developed a standardized mail questionnaire that will yield information on river use and user preferences Nationwide. Issues covered by the questionnaire include reasons for visiting the river; number, severity, and kinds of problems encountered; trip satisfaction level; perception of crowding and conflict; level of support for a variety of management practices; and descriptive characteristics of the user and the trip.

To date, over 30 rivers have been studied including some in Alaska. The study results provide the basis for developing trends through followup investigations made on a continuing basis at selected rivers. Results can be used to identify specific management problems, in planning facilities, and in developing regulations and public information efforts. Results also serve as input to environmental impact statements and Federal and State wild and scenic river classification studies.

By following prescribed procedures, river planners and managers can compile detailed-river user characteristics and opinions relating to issues within 90 days after the seasonal use of a river ends. Such information will be invaluable in making decisions on appropriate carrying capacities and river management standards. The technique is being applied to management of 26 rivers nationwide, in both urban and rural environments.

Urban waste wood--problems and opportunities. Cutting trees and tearing down old houses to make room for new construction--these are are everyday occurrences in major cities. Unfortunately, in most instances the wood goes to the dump; it is not used. In fact, approximately 20 percent of the material entering landfills in the Southern United States is urban waste wood.

A sad comment on this wasteful practice is that the technological systems for putting this waste wood to use are available, but seldom used. To correct this situation, scientists in the Urban Forestry Research Unit at the Southeastern Station conducted a conference for municipal and county waste officials, urban forestry practitioners, and concerned citizens from 17 Southern States. Attendees were informed about the potentials and techniques of using urban waste wood in the South. Scientists and engineers described the systems that are available and discussed the technical, financial, and legal barriers to full utilization of this potentially important wood supply. Papers presented at the conference were reproduced, and copies are being sent to interested people who were unable to attend.

Full utilization of urban waste wood has several obvious advantages. It would descrease the space cities require for landfills, and it would provide a largely untapped source of energy and fiber. It, therefore, would reduce our dependence on oil and natural gas and the need to cut live trees from forests. It is not yet possible to evaluate the impact of this conference on improvement of urban waste wood utilization. Distribution of the papers beyond those attending the conference should, however, maximize use of the technical information.

Evaluation shows an urban forest park is successful. A post-design evaluation of the Liberty Plaza vest-pocket park in downtown Ann Arbor, Michigan, was conducted in fall 1978, about a year after the park became a reality. The evaluation was conducted at the request of the Ann Arbor Parks and Recreation Department. The Ann Arbor citizens, the Forest Service, and the University of Michigan cooperated in the study.

This study was made because the Parks Department was interested in how the downtown vest-pocket park fared. As such, it was important to include both people actually using the park and those who live or work near it but who were not frequent users. A survey of residents showed strong satisfaction with the year-old downtown vest-pocket park. Of the few problems encountered with the park, traffic flow was the biggest, safety was of little importance, and planned activities were a source of conflicting feelings. The satisfactions were

many. The strongest among them was simply "having the park." The very presence of this urban forest providing a concentrated bit of nature in the downtown area meant a great deal to both frequent and infrequent users alike. The positive feelings the people have about the park and their sense of ownership represent important achieve ments. It is a resource to be utilized in enhancing an ongoing sense of involvement. This reasearch is of interest to planners and managers of urban open space who are responsible for providing recreation to urban residents.

Results will have direct application to the management of and planning for vest-pocket urban parks throughout the country.

Forest Products Utilization Research

Dead and dying timber--a valuable forest resource. The rising price of lumber, log shortages, and concern about future timber supplies have resulted in the extensive use of dead timber, a resource once considered valueless. Research findings show that dead timber, once thought worthless, can be used for particleboard, pulp, paper, posts, houselogs, and can be interchanged with green timber lumber. The expanding demands for chip, fiber, and fuel materials indicate the outlook for increased utilization of dead timber is good. By using dead timber, waste in managed forests and fire hazards in dead stands would be significantly reduced. Forest products industries in small towns can also benefit from the increased utilization.

Researchers have worked with public forest managers and private industry throughout the West to revise timber appraisal guidelines, set utilization standards, and lower log diameter limits to increase utilization of the dead timber resource. The total salvageable sawtimber in the West is estimated at 5.5 billion cubic feet.

New products from parallel-laminated veneer.--The use of reconstituted materials such as parallel-laminated veneer, offers the opportunity to use lower-grade, little used, or smaller raw materials for the manufacture of engineered wood components of finished products.

A number of potential market areas have been identified. These include: upholstered furniture parts, ladder rails, mobile home ridge beams, purlins, crossarms, joists, glulam beams, and mobile home truss chords.

Currently, upholstered furniture frames are produced from mixed hardwood lumber. Several manufacturers report difficulty in obtaining adequate quantities of long and/or wide parts from low-grade lumber. Appearance is not a factor, since the frame is covered by upholstery material, therefore reconstituted products can be used.

The primary advantages of producing lumber by this process are: increasing yields over conventional sawing, more uniform strength and stiffness than lumber sawn from a comparable quality of logs, and not limiting product dimensions by log dimensions.

Cooperative studies between the Forest Products Laboratory and Purdue University have shown the feasibility of producing such lumber from parallel-laminated thick-rotary-cut veneer. Feasibility of other products is being investigated in cooperation with Washington State University.

Structural flakeboard. The Forest Service's Structural Flakeboard program indicated that structural grade exterior sheathing can be manufactured from hardwood and softwood residues. This program considered the harvesting, materials, processing, economics, and marketing aspects of board manufacture. The products produced have met building code requirements for roofs and floors and the class B flame-spread rating and exceeded the fire endurance requirement for exterior walls of one- and two-family dwellings. The results of this research are available to industry to assist them in making their determinations to expand the number of flakeboard plants. In the United States, this number has risen from two to a potential of 17 to 25 plants as announced by the flakeboard manufacturers.

System 6 and commonality. System 6 is a method for using low-grade hardwoods and converting them into high quality, finished blanks. Low quality and small stems are bucked into 6-foot sawbolts, which are then made into two-sided cants. These cants are ripped into boards and dried. An automatic rough mill will then rough plane, gang crosscut, and gang rip them to remove defects leaving a virtually defect-free piece of wood. These pieces can then be glued edge-to-edge to produce the finished blank or they can be made into longer lengths by serpentine end matching and gluing edge-to-edge. These blanks can be made to fit into common groups of sizes to meet the majority of the needs of furniture and kitchen cabinet manufacturers. The manufacturers can buy the blanks in standard sizes to either make their product or produce their needed part sizes. Industry is very interested in this system and has been cooperating with Forest Service researchers in its development.

Energy efficiency can be built into houses. Innovative energy saving design and construction features are emphasized in a new research paper released by the Forest Products Laboratory called "Energy Efficiency in Light-Frame Wood Construction." The illustrated, 60-page report also contains charts and graphs that are of considerable interest to engineers, designers, architects, and builders. The first part of the report presents the role of housing design and landscape planning in building energy efficient homes, while the second half concerns engineering for energy efficiency.

This report explores such topics as building code considerations, heating losses and gains, zoning for energy balance, windbreaks and air leakage control, thermal performance, and insulation. It describes how bedrooms with an easterly orientiation offer sunlight in the morning, but not during hot summer afternoons, and how a southwesterly exposure gains solar heat in the winter. These guides to energy efficiency can make a significant improvement in the national energy budget.

Factors affecting lumber use by truss fabricators. Shortages of softwood lumber is one reason that home building costs are increasing. The use of roof and floor trusses in construction can save lumber and reduce costs. For instance, the truss frame construction system developed by the Forest Products Laboratory at Madison can reduce the use of framing material by 30 percent.

Studies have revealed that builder prejudices and architect influences were major obstacles to greater use of trusses; that raw material procurement and lumber warp were major industry problems; and that variation within some lumber grades, conflicting interpretation of the same regulatory codes, and builders' lack of knowledge about trusses are major truss fabricator concerns. The studies also showed that substantial improvements can be made in matching the specific species and grades of lumber with the demand for use in trusses.

Study results have helped several large lumber manufacturers, such as Weyerhaeuser Company, Simpson Timber Company, McMillen-Blodel, Crown Zellerbach, International Paper, and Boise Cascade improve their lumber production and marketing practices. The Truss Plate Institute and the Component Manufacturers Council have also developed programs to focus members' attention toward improvement in truss marketing and lumber procurement practices.

Basic research on lignin holds practical promise. Lignin, a major component of wood, is the second most abundant renewable biomass resource on earth. Nature could break down lignin, but not much was known about how the earth's microbes recycle lignin or how the microbes' system might be used in wood utilization. Research has given us a clear understanding of which microbes degrade lignin, how the lignin is metabolized by these microbes, and what environmental and nutritional factors favor lignin biodegradation.

Three applications have been demonstrated on a laboratory scale: (1) Partial bleaching (delignification) of kraft pulp with microbes reduces the chlorine requirement for the subsequent chemical bleaching. This lowers pollution from chlorinated lignin residue; (2) Microbial modification of lignin in coarse mechanical pulp lowers the energy requirements for final refining (fiberizing) in production of quality mechanical pulps; and (3) Microbial action decolorizes dark-colored bleaching wastes, which resist conventional biological treatment. This latter process is considered to be the most promising of the three for technical-scale development and is being further studied by the Forest Products Laboratory in cooperation with several large pulp companies (including Crown Zellerbach and St. Regis) and North Carolina State University. Continued basic research is expected to increase the number of potential applications of microbial lignin-degrading systems.

New technology benefits forestry industry. Two unrelated studies at the North Central Station are benefiting the forestry industry.

One involves simulation or computer modeling. Harvesting timber has always been financially risky as a result of widely varying stand, weather, and market conditions. But rapid mechanization, high machine costs, inflation, and the pressures to improve fuel efficiency and reduce wood waste have compounded the loggers' problems. Simulation or computer modeling is one way for loggers to stay ahead of problems concerning machine purchase and operation. For the equipment manufacturer, it is also an indispensable tool for machine design.

Simulating timber havests is not new, but the recent application of improved simulation languages by Forest Service researchers to utilize full-tree field-chipping systems has shown that harvest models can predict real system output within 10 percent. Using these models, many different combinations of equipment and operating procedures can be tested within a fraction of the time and money required to examine just one real operation. The harvest model was used in the Forest Residue Energy Program study sponsored by the Department of Energy.

The other study relates to the availability of forest residues to provide energy needs for the forest industry. Forest industries purchase about 60 percent of their energy needs and are the fourth largest industrial consumer of purchased energy. The use of forest residues as an energy source for forest industries can contribute substantially to solving the forest industry's energy needs. The development of a wood energy market could provide the key to increasing the level of forest management practiced on all forest lands, by providing markets for fiber recovered from timber stand improvement operations.

North Central Station scientists have conducted a study of the pulp and paper industry in Michigan's Upper Peninsula and Northern Wisconsin to assess the feasibility of making the industry energy self-sufficient through the use of forest residues. Analysis of the forest resource showed that the forests of the region could supply 40 million green tons of fiber annually. This is about seven times the current level of fiber utilization. Study results show that nine of the ten major pulp and paper mills within the study region could become economically energy self-sufficient through the use of forest residues by 1980.

Forest Engineering Research

Desk-top calculators serve forest engineers. Ten years ago, research engineers at the Engineering Laboratory of the Pacific Northwest Station in Seattle, Washington, acquired their first programable desk-top calculator for designing skyline logging timber sales. Today, desk-top calculators--and the programs these engineers designed to go with them--are being used to improve timber sale layout and road design throughout the West and in several other countries--Canada, Norway, and the Philippines.

At one time, the forest engineer was limited by constraints of time and money to developing only one road or timber sale design. It might or might not be the best alternative. The programable desk-top calculator enables the engineer to "play" with options--to consider many alternatives and select the one that best meets the needs.

The need for this capability has grown as the job of timber sale layout and road design has become more complex. The move away from tractor logging, the use of aerial logging systems, and increased timber harvest on rough, steep terrain with long yarding distances combined in the early 1970's to make the job of the logging engineer infinitely more difficult than it has previously been. Environmental constraints and increased use of skyline systems for commercial thinning added to the difficulty.

Over the years, Forest Service engineers have developed numerous computer programs for timber sale layout and for road planning and design. The latest addition to the engineers' bag of programable calculator "tricks" is a procedure to determine how clearcut units look from different viewpoints. Previously, this could be done only on large, central computers. Now it can be done with the programable desk-top calculator--right along with the other engineering jobs related to timber sale design.

Benefits include better timber sale layout and road design, greater safety in logging operations, improved esthetics in timber harvest areas, and increased utilization of timber on "difficult" sites.

Substituting low-grade southern hardwoods for pines in structural materials. In the South, the major unused wood resource is low-grade hardwoods growing on pine sites. In trees 5 inches in diameter and larger on these sites, about 0.8 ton of hardwoods is available for every ton of pines. If the Nation's demand for wood products is to be met, commercial uses for these hardwoods must be developed.

For the past 5 years, scientists at Southern Station have been studying new processes for utilizing low-quality, short, crooked hardwood stems. A very promising outcome from this research is hardwood structural flakeboard. This panel product would consume large quantities of hardwoods as a substitute for lumber and plywood products from softwood roundwood. Flakeboard can be used for decking, sheathing, subfloors, concrete forms, containers, pallets, etc.

The shaping-lathe headrig, also developed by Forest Service scientists, converts short, low-quality logs into crossites or posts, cants for resawing, or cylindrical bolts to be rotary peeled. Residue from this headrig is flakes of uniform length and thickness that are excellent material for manufacturing structural flakeboard. Fabrication techniques and an effective, economical resin system for gluing flakeboard of mixed southern hardwoods also resulted from this research. Economic analyses and investment and operating requirements have been investigated. This new process is now available for implementation by the forest industry.

SECTION B

STATE AND PRIVATE FORESTRY PROGRAM

Introduction

Congress, in passing the Cooperative Forestry Assistance Act of 1978 (P.L. 95-313), found that "most of the Nation's productive forest land is in private, State, and local governmental ownership, and the Nation's capacity to produce renewable resources is significantly dependent on these non-Federal forest lands." Addressing this fact, the act authorizes and directs the Secretary of Agriculture to provide for cost-sharing, technical assistance, and resource protection programs for non-Federal forest lands to be carried out through cooperation with State forestry agencies. Principal responsibility for assisting State foresters in carrying out the necessary programs within their States rests with the State and private forestry program in the Forest Service.

The act consolidates into one comprehensive authority seven laws, dating back to 1924, under which State and private forestry activities were conducted. It also complements the policies and direction set forth in the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378), commonly referred to as RPA.

State and Private Forestry programs are addressed in this report in six broad areas, each of which deals with one or more of the elements in the Cooperative Forestry Assistance Act and RPA:

Area Planning and Development
- Forest Resource Planning
- Resource Conservation and Development
- Small Watershed Program (P.L. 566)
- Flood Prevention Projects

Cooperative Forestry
- Forest Management Programs
- Utilization Programs
- Urban Forestry Assistance
- Forestry Incentives Program
- Agricultural Conservation Program
- Wood for Energy

Cooperative Fire Protection
- Cooperative Forest Fire Protection
- Rural Community Fire Program
- Fire Prevention Campaign

Forest Insect and Disease Management
- Surveys
- Suppression

Organization Management Assistance

Technology Implementation

State and private forestry activities are administered by the seven Regional Foresters in the 15 Western States, Alaska, Hawaii, and the Pacific trusteeships, and by two Area Directors in the 33 Eastern States, Puerto Rico, and the Virgin Islands (figure 1).

Targets for State and private programs are agreed on between the State forestry agencies and the Forest Service as a part of work planning and fund allocations. Their achievement depends in large measure on the availability of State funds and other resources since State funds constitute by far the largest share of funds used by the States. Considering that 58 percent of our commercial forest land is in nonindustrial private ownership, efforts to manage and protect this important resource are in the best interests of the Nation. The cooperative forestry programs of the Forest Service and State Foresters are very efficient methods for supplying the goods and services Americans have come to expect from the Nation's privately owned and non-Federal public forests and woodlands.

AREA PLANNING AND DEVELOPMENT

Forest Resource Planning

During fiscal year 1979, $1,318,000 were allotted for Forest Resource Planning. Of this, $527,000 were granted to States on a cost-share basis for the development of State forestry resource plans. There are 46 States and two territories now developing State forestry plans, an increase of six from fiscal year 1978. There are 70 planners in these State forestry organizations as a result of this funding, an increase of 34 over fiscal year 1978. The balance of funds were used by State and Private Forestry personnel to assist the States in developing model planning processes, train planners in 46 States (up 12 from fiscal year 1978), and assist these States in selecting and using planning techniques. Most of these States are in the early phases of developing State forestry resource plans. Nine States have decided to accelerate the planning process and produce interim plans to direct State forestry programs. These States, recognizing the iterative nature of planning, are improving and updating their interim plans on a regular basis with Forest Service assistance under section 8b of P.L. 95-313. State and Private Forestry personnel also provided technical assistance to State foresters in the development of best management practices (BMP's) for planning to meet requirements of section 208 of P.L. 92-500.

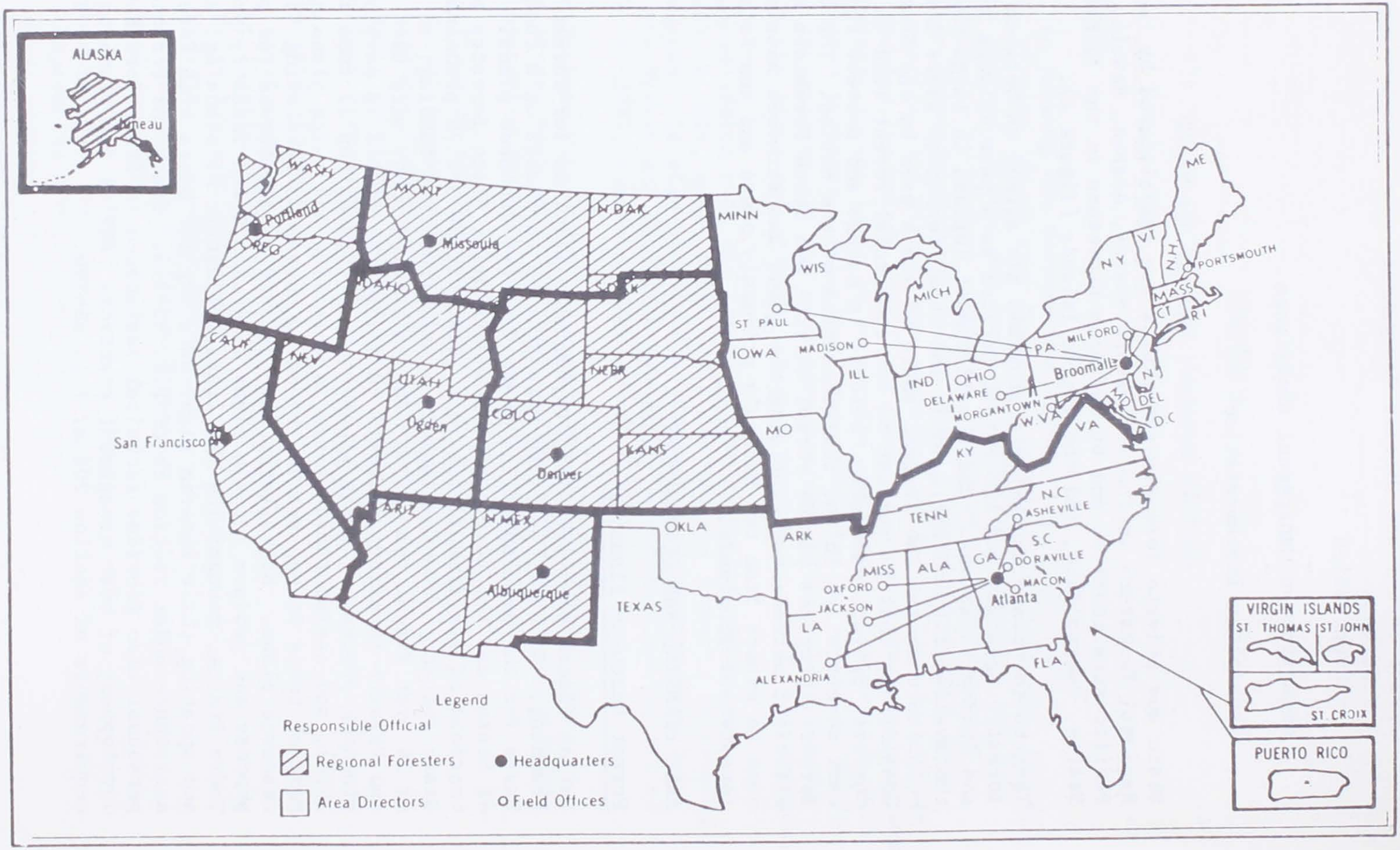


Figure 1.--State and Private Forestry Regions (West) and Areas (East).

Resource Conservation and Development

The Resource Conservation and Development (RC&D) Program uses the project or area approach to help local people improve their economic, environmental, and social well-being through accelerated resource development and planning. The projects are initiated and carried out by local people with the assistance of State agencies and agencies of the U. S. Department of Agriculture. Overall leadership is assigned to the Soil Conservation Service; the Forest Service has responsibility for forestry activities.

Each individual RC&D area develops an annual plan of work identifying accelerated forestry measures to meet its goals and objectives. During fiscal year 1979, $495,960 were allotted to the States to carry out forestry measures developed by local sponsors in 59 RC&D areas. This accelerated forestry program covered a diversity of activities, such as accelerated technical services, special studies of wood as an energy supplement, reforestation, management, development, and utilization with emphasis on multiple use.

Small Watershed Operations (P.L. 566)

The Watershed Protection and Flood Prevention Act of 1954, as amended, (P.L. 566) authorizes and directs the Secretary of Agriculture to cooperate with and assist qualified State agencies and local organizations in planning and carrying out watershed protection and flood prevention measures on authorized watersheds not exceeding 250,000 acres. Overall program responsibility rests with the Soil Conservation Service. The Forest Service is responsible for the installation of planned forest land treatment measures and certain structural works on National Forests and other Forest Service-administered lands and on non-Federal forest land in cooperation with, and through, State forestry and local agencies.

Annual allocations are made for the installation of measures included in approved watershed work plans. The majority of the Forest Service allocated funds are used to reimburse the State forestry agencies for assistance to landowners in approved watershed projects.

Table 1 shows total forest land treatment measures installed in fiscal year 1979 on all forest lands within 136 authorized watershed projects and with $904,000 of Forest Service allocated funds. (The dollars shown here are the Forest Service's share of the total funds appropriated to the Soil Conservation Service. The total amount is shown in the Soil Conservation Service's budget material.)

Table 1.--Works of improvement installed in watershed protection projects (pilot and P.L. 566) in fiscal year 1979 and to date

Works of improvement	Unit	Installed in 1979 with assistance under the watershed protection program	Est. practices "on the land" in active projects as of 9/30/79
LAND TREATMENT MEASURES:			
Channel Improvement	Miles	-	6.6
Channel Stabilization	Miles	-	13
Contour Terrace and Furrows	Miles	-	916.7
Area Treated	Acres	-	14,409
Gully Control and Stabilization	Miles	.1	195.1
Grade Stabilization Structures	No.	403	3,296
Critical Area Stabilization by Tree Planting and Other Measures	Acres	340	42,775.4
Forest Road and Roadbank Stabilization	Miles	66.5	1,893.7
Acres Treated	Acres	409.5	5,899.1
Fire, Roads, Trails, Firebreaks and Fuelbreaks	Miles	48	1,532
Fire Control Water Developments	No.	-	43
Fire Towers	No.	-	8
Intensified Fire Protection	Acres	400	2,301,195
Heliports and Helispots	No.	3	42
Mobile Fire Equipment	No.	1	60
Other Fire Control Improvements	No.	-	458
Radio Installations	No.	-	52
Forest Watershed Management Plans Prepared	No.	1,531	17,767
Area Included	Acres	101,197	1,899,703
Forest Stand Improvement	Acres	115	1,082,446
Proper Harvest Cutting	Acres	15,136	504,936
Range and Grass Seeding	Acres	116	47,490
Tree Planting and Seeding	Acres	7,538	268,562
Revegetation, Surface Mined Areas	Acres	23	1,805
Woodland Thinning and Release	Acres	5,055	697,505
Woodland Grazing Control	Acres	946	288,281
Recreation Area Development	Acres	270	31,409
Wildlife Habitat Development	Acres	2,412	26,405
Wildlife Ponds	No.	2	53

Flood Prevention Operations (P.L. 534)

The Flood Control Act of 1944 (P.L. 534) authorizes and directs the Secretary of Agriculture to carry out works of improvement for flood prevention purposes and to install measures for runoff and waterflow retardation and soil erosion prevention on 11 authorized flood prevention projects. Overall program responsibility rests with the Soil Conservation Service. The Forest Service is responsible for the restoration and preservation of desirable watershed conditions on forest lands that will help prevent floods and control sediment by means of land treatment and structural measures. The degree of State and Private Forestry participation in this program is varied and determined by the nature of the area within the flood prevention projects. Some of the projects involve Forest Service lands, and work on these lands is being carried out by the Forest Service. On projects involving State and private forest lands, forestry measures are being installed by the Forest Service in cooperation with the State forester and other agencies.

In previous years, annual allocations to the Forest Service were made for the installation of measures included in 9 of the 11 authorized flood prevention projects. Table 2 shows total measures installed on all forest lands in fiscal year 1979 within eight currently operating authorized flood prevention projects and with $4,349,000 of Forest Service allocated funds. The projects are discussed in detail below.

Little Sioux River Flood Prevention Project, Iowa. Forestry measures are installed through the Iowa Department of Conservation in cooperation with the Forest Service. During fiscal year 1979, 21 forest management plans covering 709 acres were completed, and 120 woodland owners were assisted. Proper harvest cutting was applied on 10 acres, and 69 acres of trees were planted. Woodland grazing control was accomplished on 175 acres. One acre of timber stand improvement was completed, while 15 acres of outdoor recreation development and 19 acres of wildlife habitat development were accomplished.

Los Angeles River Flood Prevention Project, California. Project activities by the Forest Service continued on the Angeles National Forest lands and on non-Federal lands in cooperation with Los Angeles City fire departments.

The fire management program accomplishments in fiscal year 1979 consisted of 5 miles of fuelbreak construction, construction of a heliport complex with 50,000-gallon cistern for fire water supply, intensified fire protection on 70,400 acres, improvement of an existing heliport, maintenance on 200 acres of ridgetop fuelbreak by discing, reduced fire hazard on 209 acres along 66 miles of roads and on 351-acre type conversion area, evaluation of the helitorch in prescription burning on fuelbreak maintenance projects, and general maintenance on two fire stations.

Table 2.--Works of improvement installed in flood prevention projects (P.L. 534) in fiscal year 1979 and to date

Item	Unit	Installed in 1979 (all funds)	Estimated total practices on land as of 9/30/79
STRUCTURAL MEASURES:			
Access Road Construction	Miles	32	145
Channel Improvement	Miles	15	38.6
Channel Stabilization	Miles	11	348.4
Diversion Ditches	Lin. Ft.	1,000	30,477
Floodwater Retarding Structures	No.	-	3
Grade Stabilization Structures	No.	-	1,115
Streambank Stabilization	Miles	-	11.3
LAND TREATMENT MEASURES:			
Critical Area Stabilization by Tree Planting and Other Measures	Acres	1,363	331,798.1
Forest Road and Roadbank Stabilization	Miles	153.2	1,931.5
Area Treated	Acres	392	18,121.9
Forest Watershed Management Plans	No.	1,569	19,739
Area Included	Acres	70,310	1,911,654
Firebreaks and Fuelbreaks	Miles	6	3,303
Fire Roads and Trails	Miles	9	525.6
Fire Hazard Reduction	Acres	-	12,125.3
Fire Water Developments	No.	2	183
Fire Towers	No.	-	46
Heliports and Helispots	No.	1	459
Mobile Equipment	No.	1	120
Other Fire Improvements	No.	2	216
Permanent Radio Installations	No.	-	313
Proper Harvest Cutting	Acres	66,206	541,600
Forest Stand Improvement	Acres	-	660,464
Tree Planting and Seeding	Acres	11,336	495,886
Woodland Thinning and Release	Acres	12,372	445,142
Revegetation, Surface Mined Areas	Acres	269	7,261
Woodland Grazing Control	Acres	1,343	184,587
Woodland Owners Assisted	No.	23,546	137,885

The critical area stabilization program consisted of planting 115 acres along 43 miles of forest roads.

Potomac River Flood Prevention Project, Maryland, Virginia, and West Virginia. The Forest Service cooperated with three States and their forestry agencies in the installation of land treatment on State and private forest lands. Additional land treatment was installed by the Forest Service on National Forests in Virginia.

Accomplishments on State and private forest lands during fiscal year 1979 included 32 miles of access road construction; 1,042 acres of critical area stabilization, 17 miles of forest road and roadbank stabilization, 1,238 forest management plans involving 29,061 acres, 9 miles of fire road and trail construction, 13,488 acres of proper harvest cutting, 1,641 acres of tree planting, 620 acres of timber stand improvement, 166 acres of revegetated surface mined areas, 1,156 acres of forest grazing control, 93 acres of wildlife habitat development, 65 acres of outdoor recreation development, and 4,214 forest landowners assisted.

Accomplishments on National Forest land included 15 miles of channel improvement and 10 miles of forest road and roadbank stabilization.

Santa Ynez Flood Prevention Project, California. The Forest Service activities include protection and improvement of the mountainous western portions of this project.

Accomplishments in fiscal year 1979 include the construction and maintenance of two water developments. One mile of fuelbreak was constructed and 30 miles were maintained. Road betterment of 27 miles was accomplished, which included various phases of construction and maintenance. Many hours of fire manning were carried out. One forest soils land management plan was developed. Intensified fire protection accomplished on 6,300 acres.

Trinity River Flood Prevention Project, Texas. The Forest Service has continued its participation in the planning and installation of structural and land treatment measures on those lands in the project that fall within the National Grasslands.

Sixty-eight acres of critical area stabilization and 1,000 feet of diversion ditches were completed in fiscal year 1979.

Washita River Flood Prevention Project, Oklahoma. The Forest Service and Oklahoma Division of Forestry participated in the planning and accomplishment of flood prevention measures for private forest lands in the project area. Additional land treatment was installed by the Forest Service on National Grasslands.

Fiscal year 1979 activity and accomplishment on private forest lands included 3 acres of critical area stabilization, 6 forest management plans covering 181 acres, 21 acres of tree planting, 130 acres of forest stand improvement, 418 acres of wildlife habitat development, 5 acres of outdoor recreation development, 2 miles of gully control and stabilization, and 40 forest landowners assisted.

Accomplishments on the National Grassland included 11 miles of channel stabilization, 5 miles of forest road and roadbank stabilization, 7 acres of tree planting, 12 acres of forest stand improvement, 3 acres of contour terrace and furrows, and 12 acres of range and grass seeding.

Yazoo and Little Tallahatchie Rivers Projects, Mississippi. Forestry measures for both of these projects are provided by the Forest Service.

In fiscal year 1979, critical area stabilization was accomplished on 250 acres and 294 forest management plans were prepared covering 40,359 acres. Proper harvest cutting was accomplished on 52,708 acres. There were 9,590 acres planted in trees. Other accomplishments included 73 miles of forest road and roadbank stabilization, 285 acres of timber stand improvement, 103 acres of surface mined areas revegetated, 1,047 acres of wildlife habitat development, 713 acres of outdoor recreation development, and 1,108 miles of gully control and stabilization. During fiscal year 1979, assistance was given to 19,712 forest landowners.

Accomplishments on the National Forest lands included 5 miles of forest road and roadbank stabilization and 8 acres of tree planting.

Coosa River Flood Prevention Project, Georgia and Tennessee. The forestry portion of this program has been completed.

Buffalo Creek Flood Prevention Project, New York. The project has been closed out.

Middle Colorado Flood Prevention Project, Texas. There is no forestry component in this project.

COOPERATIVE FORESTRY

Forest Management Programs

Forest management assistance provided under authority of the Cooperative Forestry Assistance Act, section 3 (Rural Forestry Assistance) includes technical forest management assistance for nonindustrial private forest landowners and production and genetic improvement of tree seedlings for forestation. These activities are cost-shared by the State forestry agencies and the Forest Service. Forest management technical assistance accomplishments shown in table 3 reflect forestry advice and assistance provided to landowners by professional State forestry personnel.

The number and acreage of forest land management plans completed are significantly higher than funded targets (table 3). This reflects increasingly strong demand by landowners for assistance. The plans are important in that they are the catalyst for appropriate forest management activities.

The total acreage of accomplishment for recreation, wildlife and fish, and range assistance is approximately equal to the targeted acreage (Table 3). Assistance for wildlife and fish habitat improvement is higher than targeted, while range improvement and recreation assistance are lower. Landowners are showing increasing interest in wildlife habitat management, and many State forestry agencies are placing more emphasis on this element. The increased emphasis on wildlife is a significant factor in the reduced assistance for recreation and range.

Reforestation accomplishments are somewhat higher and timber stand improvement lower than targeted (table 3). Emphasis on reforestation has been increased, particularly in the South where a significant net reduction in softwood producing acreage has been occurring in recent years. The shortfall in timber stand improvement is due primarily to severe constraints on the use of herbicides for forestry purposes. Other activities, such as recreation and forest range management, which are highly dependent on manipulation of existing forest stands, are also affected by reduced use of chemicals.

Targets and accomplishments for timber harvesting are lower than last year. This is attributed to an increase in referrals, by State forestry agencies, to consulting foresters to provide assistance for landowners. Referring as much forestry activity as possible to consultants, especially revenue-producing activities, allows State forestry agencies to increase service to lands that have not reached harvest maturity.

The high production and distribution of forest tree seedlings by State nurseries is consistent with the upward trend in reforestation (table 3). Production of genetically improved tree seed is consistent with the target as States increase emphasis on seed orchard production and established orchards become more productive.

The economic and environmental benefits of assistance in forest management and processing are substantial. Over half the Nation's commercial forest land is in nonindustrial private ownership, and our lumber and wood fiber supplies are significantly dependent on these lands. The thrust of the cooperative programs is to increase and improve management and utilization efficiency. Proper management not only increases supplies of wood, but also provides such associated forest resource values as aesthetics, recreation opportunities, wildlife and fish habitat, improved soil fertility, and improved quality of water yields.

Table 3.--Forest management technical assistance targets and accomplishments for cooperative forestry programs--fiscal year 1979.

Item	Unit of measure	RPA estimates High	RPA estimates Low	FY 1979 funded targets	FY 1979 accomplishments
Technical Assist - Forest Land Mgmt. Plans	Thousand Plans	75.8	70.8	43.3	48.6
Technical Assist - Forest Land Mgmt. Plans	Thousand Acres[1/]	5,300.0	5,000.0	3,000.0	3,500.0
Recreation Technical Assistance	Thousand Assists	17.8	16.7	2.0	1.3
	Thousand Acres	----	----	110.6	71.8
Wildlife and Fish Technical Assistance	Thousand Assists	38.0	35.3	3.2	5.0
	Thousand Acres	----	----	140.0	218.9
Range Landowner Assistance	Thousand Assists	14.2	13.9	0.7	0.5
Forest Range Improvement	Thousand Acres	1,800.0	1,700.0	60.0	44.2
Technical Assist - Timber Harvesting	Million Cu. Ft.	----	----	200.00	186.0
Reforestation	Thousand Acres[2/]	764.0	720.0	342.9	370.9
Forest Incentives Program	Thousand Acres	----	----	(182.9)	(212.0)
Timber Stand Improvement	Thousand Acres[2/]	529.0	498.0	254.5	239.4
Forest Incentive Program	Thousand Acres	----	----	(149.5)	(117.6)
Seedling Production and Distribution--State Nurseries	Million Seedlings	1,086.0	1,023.0	550.0	644.7[3/]
Improved Tree Seed	Thousand Pounds	----	----	32.0	32.6
Improved Utilization	MMCF[1/]	327.0	302.0	180.0	157.8
U&CF Assistance	Urban Areas Asst'd	1,900.0	1,876.0	5,800.0	6,692.0

1/ For equivalency with current planning and reporting requirements, the indicated 1975 RPA Recommended Program units of measure have been converted.

2/ Includes non-cost share, FIP, and ACP. FY 1979 accomplishment differs from figure in FY 1980 Explanatory Notes since that figure only includes non-cost share.

3/ Figure reflects cooperative accomplishment for the cooperation in Forest Tree Production Tree Program and Federal technical assistance to other State tree nursery programs.

Nonindustrial private forest lands are producing far below capacity, yet they are the lands that must do most to compensate for expected shortfalls in forest resources after the year 2000. The Rural Forestry Assistance Program exists to provide forest management and processing assistance to these private landowners and processors with the intent of increasing the resources available from these lands. Detailed information by fiscal year, State and Forest Service Regions and Areas is in appendix B, tables 1, 2, and 3, respectively.

The cost effectiveness and actual benefits of this technical assistance have been difficult to determine. An intensive effort is now underway to analyze economic opportunities on nonindustrial private lands and cost effectiveness of Federal assistance programs. One recently completed study indicates that financial returns of 4 percent or more for forest management investments are possible on 124 million acres of nonindustrial private forest land. Internal rates of return for various treatments in different sections of the country range from 4 to 26 percent with most over 10 percent. High stumpage prices provide landowners an incentive to harvest their mature timber, but, due to the many years required for a tree seedling to reach maturity, there is little economic motivation for reforestation. High cost of investment capital, tax problems, and long-term exposure to risks (fire, insects, diseases, wind, etc.) are other factors that inhibit intensive management of nonindustrial private forest lands. Forestry expertise, guidance and incentives will be necessary to realize the potential of these investment opportunities.

An analysis of investments in the 1974 Forestry Incentives Program indicates an average internal rate of return of 10.2 percent on direct treatment costs, both public and private. The study results emphasize the need for careful selection of sites and adherence to accepted forestry standards to maximize the effectiveness of Federal investments. This requires the involvement of professional forestry experitse. Thus, an effective cost-share program cannot be achieved unless it is associated with an equally effective technical assistance program.

Utilization Programs

Section 3 (Rural Forestry Assistance) of the Cooperative Forestry Assistance Act also provides authority to work with wood processors for the purpose of encouraging optimum use of the Nation's timber resources. Increased yields gained by cooperative firms and the development of new industries and new markets successfully achieve the three goals of: 1) Increased productivity, 2) a reduction of the ratio of unit of resource to unit of product, and 3) residue reduction.

On-the-ground assistance is generally delivered by State forest products utilization (FPU) specialists in cooperative programs, with technical backup by State and private forestry specialists.

Through process analyses, the specialists are able to develop expressions of a firm's current efficiency in converting raw material to wood products. Corresponding expressions of attainable conversion efficiency, as available in published form or as calculated by computer simulation, are compared with the mill's current situation to determine the percentage of yield improvement possible. An operator can readily translate conversion improvement to profit improvement. In turn, his response to economic motivation achieves the goal of extending the Nation's timber supply.

The shortfall in reported utilization improvement (table 3) results from an unanticipated shift in emphasis in both harvesting and sawmilling activities in some Regions toward serving small operations, and a major impact on specialists brought about by increasing demands for assistance related to the use of wood for energy.

In the Improved Harvesting Program (IHP), reevaluations of formerly analyzed logging operations were stressed to establish a measure of program effectiveness. Responding to the former success of the Sawmill Improvement Program (SIP) in demonstrating the importance of manufacturing precision, utilization specialists devoted considerable time participating in workshops and in on-the-ground instruction on the concepts and application of quality and process control techniques. The long-range effectiveness of these efforts is expected to be very significant but is difficult to measure in the initial stages.

Appropriate liaison with industrial consultants is also on the rise, with an accompanying increase in confidence in the FPU activities by that group also.

The limited expressions of actual utilization improvement usually require that accomplishments in forest products utilization activities be estimated. In order that those estimates have factual support, two of the major programs included in FPU, the Improved Harvesting Program (IHP) and the Sawmill Improvement Program (SIP), have provisions for followup or repeat studies of formerly analyzed operations. Comparisons of first and second studies at individual operations indicate that loggers and millers who responded to the initial recommendations increased their yields, on the average, by five and seven percent, respectively.

A detailed report summarizing and projecting the results of 45 followup SIP studies indicated that the value of resources to be saved over a 4-year period, compared to the total involved costs of participating agencies, would result in a benefit/cost ratio of 435:1. If only 10 percent of the indicated improvement was attributable to the program it would result in a ratio of about 44:1.

Urban Forestry Assistance

Urban forestry assistance provided under authority of the Cooperative Forestry Assistance Act, section 6, includes education and technical urban forestry assistance to local government units and others. The cost of these activities is shared by the State forestry agencies (or through sub-grants, by local government units and others) and the Forest Service.

The objective of the Urban Forestry Assistance Program is to improve the quality of life (environmentally, economically, and aesthetically) in both urban areas, big cities and in small communities.

Urban forestry technical assistance accomplishments shown in table 3 reflect urban forestry advice and assistance provided to local government units, organizations, and urban residents by State forestry personnel. Accomplishments are nearly four times the RPA estimates of 1975, at which time there was little information on which to base the progress of a Forest Service/State urban initiative. Accomplishments are higher than funded targets because more States participated in this new program than had been anticipated.

In this second year of Federal financing of the Urban Forestry Assistance Program, 49 States, Puerto Rico, the Virgin Islands, and Guam participated. Only Tennessee and the District of Columbia did not utilize available funding. Eleven States and Guam used less than the full amount allotted them, but the balance was effectively used by other States. Fifty additional State urban forestry personnel were hired (or reassigned from other duties) for urban forestry activities bringing the total person-years of technical assistance to 150, including 90 full-time and 170 part-time personnel.

Technical assistance is provided for planning, including the establishment of goals and objectives for the urban forest resource; for planting, including advice and training in the selection of species; for care and maintenance, including assistance in the management of the urban forest resource (e.g., pruning, removal, pest control, stress testing, etc.); for utilization, including advice for the marketing and disposition of urban wood wastes; for demonstration projects and pilot tests, including species adaptability, cultural practices, management alternatives, and urban tree evaluation; for promotion of special programs, including Arbor Day and Tree City USA; for urban development or renewal, including advice on the protection and management of the existing urban forest resource in both urban areas and potential urban areas; for multiple-use management, including advice relative to recreational use, aesthetics, watershed values, and wildlife habitat; and for training, including the promotion and presentation of training sessions, workshops, and seminars to develop and expand the expertise of any and all personnel, in both the public and private sectors involved in urban forestry.

Twenty-five States have subgranted at least a part of their urban forestry assistance funds to cities and organizations. These subgrants total one-sixth of the amount available to all the States, with an increasing amount being used by the private sector. The State foresters continue to be accountable for the urban forestry funds, whether or not they are expended directly by the State or subgrantee. Subgrants have been made available to large cities for inner city work with minorities and the underprivileged, and to some isolated, small communities.

Many national organizations have also become greatly involved in urban forestry. Generally, this is a redirection of emphasis for organizations that were earlier involved, almost 100 percent, in traditional (rural) forestry or arboriculture. These organizations include: the American Forestry Association, the Municipal Arborist Association, the National Arborist Association, the National Arbor Day Foundation, the Society of American Foresters, the Society of Municipal Arborists, and the International Society of Arboriculture. Few of these organizations have had communication with one another. In 1979, the Forest Service made an effort to bring these organizations and other Federal agencies into closer association with the States, and cities, and the private sector in order to transfer information because of the lack of a computerized urban forestry system of technology transfer.

Other 1979 accomplishments include successful contracting with the private sector for the following information: a guide to the urban tree inventory systems already on-line throughout the country; a study of the information needs in urban forestry prior to the development of a Nationwide computer system for the transfer and retrieval of technological information; a directory of national organizations involved in urban forestry; a summary of job descriptions for urban forestry positions in the public sector; an analysis of some municipal tree and landscape ordinances; a summary of State, county, and city procedures for certifying and licensing arborists; and most vital of all, a summary of all Federal assistance for urban forestry.

Forestry Incentives Program

The Forestry Incentives Program (FIP) was initiated in 1974 and is jointly administered by the Forest Service and the Agricultural Stabilization and Conservation Service (ASCS). The program is administered through State forestry organizations and the State and county offices of the ASCS and provides cost-sharing and technical assistance to non-industrial private forest landowners for reforestation and timber stand improvement practices.

The FIP was originally authorized by the Agriculture and Consumer Protection Act of 1973 (P.L. 93-86), but was incorporated into the Cooperative Forestry Assistance Act of 1978 (P.L. 95-313) as section 4.

Fiscal year 1979 was the first year that FIP was administered under the new authority. P.L. 95-313 provided for two basic changes in program direction. First, for eligibility, the maximum acreage of forestland in one ownership was increased from 500 to 5,000 acres, with special approval required for ownerships of over 1,000 acres. The change required a revision of the original apportionment procedure used to allocate cost-share funds to the States. The other basic change incorporated the consideration of the other forest resources in addition to timber production. In developing the forest management plan, the maintenance or enhancement of wildlife habitat, watershed protection, recreation, range, and aesthetic values must be considered. Program guidelines have been revised incorporating these requirements.

The FIP accomplishments in fiscal year 1979 are equal to 99.2 percent of the funded goals (table 3). The ban on use of herbicides was partially responsible for the shortfall in timber stand improvement.

Fiscal year 1979 FIP accomplishments are:

212,000 acres of reforestation at $54.43 per acre and

117,000 acres of timber stand improvement at $24.21 per

acre for a total of 329,600 acres.

The 329,600 acres is the largest single-year accomplishment for the program. Average annual accomplishment for the 6-year program is 246,000 acres.

The total accomplished since 1974 is 741,059 acres of reforestation and 737,331 acres of timber stand improvement. Congress appropriated total cumulative funds of $88,750,000.

The FIP for fiscal years 1977 through 1979 is reviewed in terms of carry-over funds, unmet demand, payments for completed work, and work in progress.

Two years ago (fiscal year 1977) there was considerable concern about the amount of carryover cost-share funds; $4.2 million. These were allocated funds not obligated by the end of the fiscal year. Through a concerted effort by the States, the amounts of carry over funds was reduced to $1.8 million in 1979.

Many requests by landowners cannot be approved because of lack of funds and are called unmet demand. A three-fold increase in this category has occurred during the last three years; some States have stopped taking requests.

Cost-share payments, referred to as amount earned, are made to the landowners for completed FIP practices. In 1979 the amount earned exceeded the $13.5 million allocated by $942,000. Cost share funds of $13.5 million was allocated to the States in each of fiscal years 1977, 1978 and 1979.

The work in progress, called outstanding approvals, refers to work being done but not completed. The landowners are not paid until the project is completed. The value of the outstanding projects has remained rather constant for the last three years. Problems with reducing this item include availability of nursery stock, venders for planting and timber stand improvement, and limited staffing capability of some State forestry organizations to meet demand for technical assistance.

F.Y.	Carryover Funds	Unmet demand	Amount earned	Outstanding approvals
		(million dollars)		
1979	1.8	14.350	14.458	22.315
1978	2.1	9.797	12.622	22.394
1977	4.2	5.141	10.746	20.294

Agricultural Conservation Program

The Agricultural Conservation Program (ACP) is jointly administered by the Forest Service and the Agricultural Stabilization and Conservation Service (ASCS). Two ACP cost-share practices are reforestation and timber stand improvement. Up to 80 percent of the implementation costs may be shared by the Federal Government. State and Private Forestry has the responsibility for providing technical assistance to implement these practices. This is accomplished through the State forestry organizations.

Of the 610,300 acres of reforestation and timber stand improvement shown in table 3, 113,353 acres is credited to the Agricultural Conservation Program. This is the largest yearly accomplishment since the 114,414 acres accomplished in 1974 and represents a 50 percent increase over fiscal year 1978, when 75,357 acres were recorded.

The 113,353 acres accomplished in 1979 consist of 47,265 acres of reforestation at a cost of $44.66 per acre to the Government, and 66,088 acres of timber stand improvement at a cost of $18.88 per acre.

ACP works well in concert with the FIP as ACP is basically a conservation oriented program without the timber productivity requirements of FIP. ACP provides for forest management practices on the less productive sites to help maintain the resource base in place and to restore productivity lost as the result of unsound land use.

The upswing in ACP this year is partially connected with the energy situation. With the recognition of wood as one of the viable alternatives in the energy crisis, more emphasis will be put on the forestry practices of the ACP. An example is the pilot fuelwood project established in the summer of 1979 in selected counties in the four New England States of Maine, Vermont, Massachusetts, and New Hampshire. The increased demand for wood energy is exerting considerable pressure on the small private woodlot owners to produce fuelwood. The majority of the cutting is in young hardwood stands and is being applied without technical assistance from foresters. As a result, silviculturally sound practices were not being applied in a vast majority of cases. The desirable crop trees in these stands were being prematurely cut and many of the stands were being completely devastated. The ASCS and the Forest Service jointly agreed that additional ACP funds should be shifted to this region to provide increased assistance to these landowners, resulting in better forest management practices and increased production of wood for energy. In October 1979, the project was expanded Statewide in the four original States, and the States of Connecticut and Rhode Island were added. The project accomplishments will be recognized in the fiscal year 1980 report.

Wood for Energy

During fiscal year 1979, State and Private Forestry has responded to increased demands to provide assistance in the wood energy field. Although Forest Service policy, programs, and organizational needs were in a process of development, much work was accomplished in the State and private sectors. These activities were performed with the objective of achieving a more intensive level of forest land management related to both the increased production and better utilization of forest products.

Since nearly three-fifths of the commercial forest land in this country is in nonindustrial private ownership, State and Private Forestry can make a substantial contribution to the Nation's capability to produce wood for energy, both now and in the future.

State and Private Forestry works primarily through and with State forestry organizations in accomplishing wood energy objectives. Training, technology implementation, and technical assistance comprise the majority of State and Private activities.

During fiscal year 1979, State and Private Forestry personnel conducted wood energy training sessions in several States. Also, various types of training and informational materials were developed or are in the process of development.

Assistance is being provided to States and cities for conducting various types of wood energy surveys. A survey was completed in the San Francisco Bay area for the purpose of developing a model for use by other metropolitan areas to determine the amount of wood residues being generated. A survey is being conducted in the State of New York to determine

the amount of wood residues available from land clearing projects. The State of Maryland is making a survey to identify public institutions and other plants that could be candidates for converting to wood as an energy source. The State of Vermont has completed a report on "Skidding Firewood with Small Tractors" and has also completed a draft report on whole tree harvesting to produce wood chips.

The pilot fuelwood project described in the ACP section is expected to yield 80,000 cords of wood for energy and will implement sound silvicultural practices on 10,000 acres of timber stands on small nonindustrial private ownerships.

In addition to providing technical assistance as support to State forestry organizations, State and private forestry personnel were directly involved in providing information and assistance to various organizations.

Several potential large volume users, including the brick and cement industry, public and private institutions, and municipal power generation plants are receiving and responding to technical assistance. The assistance includes providing resource data, information on wood burning problems, wood burning conversion values, and storage space requirements.

COOPERATIVE FIRE PROTECTION

Rural Fire Prevention and Control

The Forest Service is authorized under the Rural Fire Prevention and Control Program (Cooperative Forestry Assistance Act of 1978, section 7) to provide financial, technical, and related assistance to the States for the prevention, control, suppression, and prescribed use of fires on non-Federal forest lands and other non-Federal lands, including rural lands and rural communities. Nationally there are approximately 1.5 billion acres of land that qualify for protection under this Act. Targets for 1979 were set to protect 708 million acres, keeping the number of human-caused fires at or below 145,000 and the number of acres burned at or below 2.1 million. (The RPA targets are 1.004 million acres, 85,187 human-caused fires and 2.1 million acres respectively.) Yearend accomplishment reports indicate that 774 million acres were protected, while the numbers of human-caused fires and acres burned were held to only 127,000 and 1.5 million, respectively (table 4). These loss figures represent significant reductions from the previous year. While part of the reductions can be attributed to less severe fire-weather occurrence, much of the credit for these reductions must go to the State and local fire protection forces around the country supported by sound Federal funding and input.

This was the first full year of operation under the new Cooperative Forestry Assistance Act. It is well to note that the programs involving cooperative fire protection activities now are under one section of one Act. The results of this Act make benefits to local, State, and Federal fire protection programs more coordinated. Through this greater cooperation, benefits in terms of timber yield, water quality, recreation opportunities, and improved and maintained fish and wildlife habitats, can be realized.

In 1979, section 7 funding was substantially the same as 1978. Accomplishments were:

- Person-years additional personnel--34

- Additional vehicles acquired (excess property)--1,588

- New prevention programs in States--18

Assistance to rural communities of under 10,000 population is now a part of section 7, Cooperative Forestry Assistance Act of 1978. Funds for carrying our these activities are transferred to the Forest Service by the Farmers Home Administration.

Organizing, training, and equipping of rural forces continues:

- Communities receiving assistance--3,500

- Firefighters trained--20,614

- New fire organizations formed--105

- Federal excess equipment converted or modified for firefighting--1,047

Smokey Bear. The Cooperative Forest Fire Prevention Campaign, the Smokey Bear Program, through the cooperation of the advertising industry and the National Association of State Foresters, continues to make great strides in reducing human-caused fires.

Through the efforts of the Advertising Council and the Nation's radio and television industry, the Smokey Bear Program received public service air time estimated to be worth more than $53 million.

The success of two separate mailings emphasizing, "If Not You--Who?," for the 1979 public radio announcements strengthens the traditional Smokey Bear message, "Remember--Only You Can Prevent Forest Fires."

Table 4.--Wildfires on state and private areas protected under the Cooperative Forestry Assistance Act (P.L. 95-313), section 7--calendar year 1978 1/

State	Area Protected	Human-Caused Fires	Human-Caused Area Burned
	(Thousand Acres)	(Number)	(Acres)
Alabama	25,029	9,562	343,902
Alaska	22,052	256	822
Arizona	18,328	158	5,724
Arkansas	20,698	3,627	63,555
California	33,325	10,420	128,721
Colorado	23,416	287	6,291
Connecticut	2,390	1,401	2,453
Delaware	557	23	60
Florida	26,243	6,330	78,973
Georgia	27,279	16,153	61,803
Guam	82	1,010	7,539
Hawaii	3,306	401	17,308
Idaho	7,126	247	10,891
Illinois	8,453	40	539
Indiana	7,328	94	622
Iowa	7,612	620	3,205
Kansas	19,792	1,572	79,287
Kentucky	17,026	1,819	38,018
Louisiana	20,939	8,012	92,505
Maine	17,743	1,132	3,135
Maryland	3,700	581	1,390
Massachusetts	3,581	9,525	8,881
Michigan	19,675	713	2,622
Minnesota	22,830	1,066	15,814
Mississippi	19,858	9,850	123,744
Missouri	15,696	2,159	13,833
Montana	19,147	139	364
Nebraska	27,154	1,465	16,582
Nevada	8,777	126	1,514
New Hampshire	4,631	1,561	626
New Jersey	2,705	1,451	5,103
New Mexico	40,199	231	2,296
New York	16,958	766	7,119
North Carolina	20,817	4,579	35,795
North Dakota	13,294	311	8,894
Ohio	5,823	433	1,144
Oklahoma	5,087	1,761	48,821
Oregon	13,029	506	5,007
Pennsylvania	19,541	1,134	5,086

Table 4.--Wildfires on state and private areas protected under the Cooperative Forestry Assistance Act (P.L. 95-313), section 7; calendar year 1978 (con.)

State	Area Protected	Human-Caused Fires	Human-Caused Area Burned
	(Thousand Acres)	(Number)	(Acres)
Puerto Rico 2/	0	0	0
Rhode Island	512	726	736
South Carolina	13,289	9,287	40,599
South Dakota	25,816	404	47,624
Tennessee	12,478	4,273	44,329
Texas	22,123	3,474	48,020
Utah	14,724	296	1,492
Vermont	4,638	155	176
Virginia	18,518	3,184	9,849
Virgin Islands 2/	0	0	0
Washington	13,177	572	4,221
West Virginia	12,833	1,529	31,729
Wisconsin	18,898	1,214	1,616
Wyoming	25,540	430	3,842
Total	773,772	127,245	1,484,221

1/ Fire statistics are collected on a calendar-year basis in cooperation with the States and other Federal agencies. Calendar year 1979 figures will be available by June 1980.

2/ Not included in program in calendar year 1978; no statistics available.

FOREST INSECT AND DISEASE MANAGEMENT

Introduction

The Integrated Pest Management (IPM) Program was highlighted during fiscal year 1979 with prevention, suppression and special projects being carried out to reduce losses due to insects and diseases in all forest resources. These activities were directly accomplished on Federal lands, and in cooperation with State foresters, on State and private lands. Cooperation with the States consisted primarily of technical assistance and financial assistance for cooperative suppression projects.

Survey and Assistance

Detection and evaluation surveys were made on 636 million acres of all ownerships in fiscal year 1979; The funded target was 493 million acres. The 1975 RPA Program high target for insect and disease surveys (840 million) was not accomplished in fiscal year 1979. The level of insect and disease activity has been less than anticipated in the RPA program, and the 1979 program was planned and conducted accordingly. This was mainly because of the very high targets and goals set for the program when it was written in 1975.

Emphasis was given to inclusion of forest insect and disease management strategies in the land management planning process and resource management plans in fiscal year 1979. Nationwide this was done for 150 plans.

During 1979, the Forest Service Manual chapter on Pesticide-Use Management and Coordination was revised, introducing a new chapter on integrated Pest Management. A forestry section of Agriculture Handbook No. 554, "Guidelines for the Control of Insect and Mite Pest of Foods, Fibers, Feeds, Ornamentals, Livestock, Forests, and Forest Products" was developed.

The revision and updating of the Forest Insect and Disease Management section (3400) of the Forest Service Manual was completed and sent to the field. An air pollution task force report entitled "Air Pollution Effects on Forest Vegetation and the Analysis of the Role of Forest Insect and Disease Management" was completed and is now ready for distribution.

Prevention and Suppression

Operational suppression projects were conducted against the mountain pine beetle and dwarf mistletoe in the West, the southern pine beetle in the Southeast, the spruce budworm and gypsy moth in the Northeast, the Douglas-fir tussock moth in New Mexico, and the western spruce budworm in Idaho and Oregon. A total of 4.9 million acres of timber

received treatment. Suppression efforts surpassed the 1975 RPA Program estimate of 4.2 million acres because the Maine spruce budworm project suppression activities included 2.9 million acres.

Bark beetle outbreak trends were static to upward in 1979. The mountain pine beetle was static in the West, but the southern pine beetle started its cyclic upward trend in the Southeast. Salvage and removal of infested trees have helped to reduce beetle population buildups and spread. In the Southeast, salvage of 43.7 million cubic feet of timber was accomplished. In the West, 85.5 million board feet of timber were salvaged from beetle-infested areas.

The pesticides carbaryl, dylox, acephate, and Bacillus thuringiensis were used on a 2.9 million-acre cooperative suppression project in Maine. Carbaryl gave the best population reduction and foliage protection. This suppression effort prevented mortality of about 1.2 million cords of wood. Suppression of the western spruce budworm in Oregon with carbaryl prevented mortality of about 92 million board feet of timber. Carbaryl was also very effective in reducing budworm populations in Idaho on 70,000 acres of sawtimber.

A total of 643,500 acres of forests in the Northeast was infested with the gypsy moth in 1979. This was 656,500 acres less than 1978. Cooperative suppression efforts were accomplished in Pennsylvania, New Jersey, New York and Vermont on 61,000 acres using the pesticides carbaryl, dylox, diflubenzuron, and Bacillus thuringiensis (B.t.). Carbaryl gave the best population reduction and foliage protection of all the materials used.

Dwarf mistletoe surveys and suppression projects were performed in seven Regions. A total of 52,547 acres was surveyed and 10,564 acres were silviculturally treated to suppress the disease.

As a result of the Dutch elm disease control and utilization program, 42 towns and cities in 5 States (Minnesota, Wisconsin, Georgia, Colorado, and California) have established Dutch elm disease control and elmwood utilization demonstration areas. After 3 years, most of these demonstration areas have shown that Dutch elm disease incidence can be effectively reduced and that there are various ways that elm trees infected and killed by the disease can be used. Treatments reduced infections to 5.7 percent in 1979.

Special Projects

A total of 45 special projects, including loss assessment, pilot control, and demonstration, were initiated or continued to evaluate new survey and control techniques and materials and to assess forest resource losses being caused by insects and diseases. Integrated pest management strategies are being evaluated for control of the spruce budworm and gypsy moth in the Northeast; mountain pine beetle, western spruce budworm, dwarf mistletoe, and root rots in the West; southern pine beetle and seed orchard insects in the South; and Douglas-fir tussock moth in the Southwest.

Examples of some recent accomplishments are:

- In the Northeast, biological pesticides disparlure, disparlure plus Bacillus thuringiensis (B.t.), and the nucleopolyhedrosis virus (NPV) effectively reduced the number of gypsy moth egg masses on treated areas in Pennsylvania.

- The use of mycorrhizae improved the seedling growth rate, root formation, and vigor in the nursery and the survival of outplanted conifer seedlings.

- Diflubenzuron, a biological growth regulator, reduced gypsy moth larval populations 98 percent and protected 75 percent of the foliage in a small spray project in New York.

- The nucleopolyhedrosis virus (NPV) effectively reduced egg mass populations of the Douglas-fir tussock moth in the Southwest by 99 percent.

- Special projects demonstrated that an integrated pest management system effectively controlled the mountain pine beetle; enhanced beauty, wildlife, and recreational opportunities; and reduced fire danger along the Colorado Front Range on National Forest and State and private lands. The original demonstration area established in 1977 has given excellent results during the past year.

ORGANIZATION MANAGEMENT ASSISTANCE

The objective of the Organization Management Assistance Program is to provide financial, technical, and related assistance to State Foresters or equivalent State officials for the development of stronger and more efficient organizations that can better fulfill their responsibilities for the protection and management of non-Federal forest lands.

In fiscal year 1979, approximately 140 major assists were provided to cooperative forestry assistance fund recipients. Major activities included improvement of on-the-job relationships, assessment of managerial and organizational problems and needs, workload analysis, conducting safety reviews and seminars, reviews of forestry education and information programs, organization studies, and assistance in grant administration.

TECHNOLOGY TRANSFER

The Forest Service is placing new emphasis on the importance of getting better knowledge and technology put into use and giving new recognition to its need in nearly every phase of the Agency's work. A Technology Transfer Staff Group serves and is responsive to all five deputy areas. The group's mission is to help Forest Service managers and cooperators ensure that the best forest and range technology is applied to improve the management of the Nation's renewable resources in the broadest sense.

A policy for developing and maintaining a single Forest Service bibliographic data base, named CORR (Communications on Renewable Resources), has been established. CORR will be available to the public through the facilities of Bibliographic Retrieval Services following a preliminary test and evaluation phase.

SECTION C

NATIONAL FOREST SYSTEM

Introduction

The Forest Service is responsible for the management, protection, and use of the 187-million-acre National Forest System (appendix table C 1) for a sustained flow of economic and social benefits, including recreation, wood, forage, wildlife habitat, water, and minerals.

The System encompasses nine Regions containing 154 National Forests, 19 National Grasslands and 17 Land Utilization Projects located in 44 States, Puerto Rico, and the Virgin Islands (figure 1). The natural resources on these lands represent some of the Nation's greatest assets having major economic, environmental, and social significance to millions of Americans.

The following discussion is by resource element. Each element is discussed in a discreet subsection and can be readily found through the table of contents under section C, National Forest System. Activities that support the resource elements, such as land management planning and landline location, have been grouped into the last subsection which is called "Services in Support of Management."

All references to RPA mean the document sent to Congress in 1976.

Summary

The RPA Program sets targets for key primary and intermediate outputs for each resource for each of the years covered by the program. A range of targets was developed for each output. The extremes of the ranges are referred to as the high and low RPA estimates. The accomplishment of the key outputs for the National Forest System are summarized in table 1. Table 1A lists these program accomplishments and provides the equivalent budget line item cost. This provides approximate cost-effectiveness data for each Forest Service resource system and support element. Discussion of the key outputs and other program accomplishment information is in the following subsections of section C and in appendix C.

RECREATION AND WILDERNESS MANAGEMENT

Introduction

The goal of recreation management within the Forest Service is to develop, administer, and protect National Forest System lands in a manner that produces opportunities for quality recreation experiences and related services in conjunction with the provision of other goods and services.

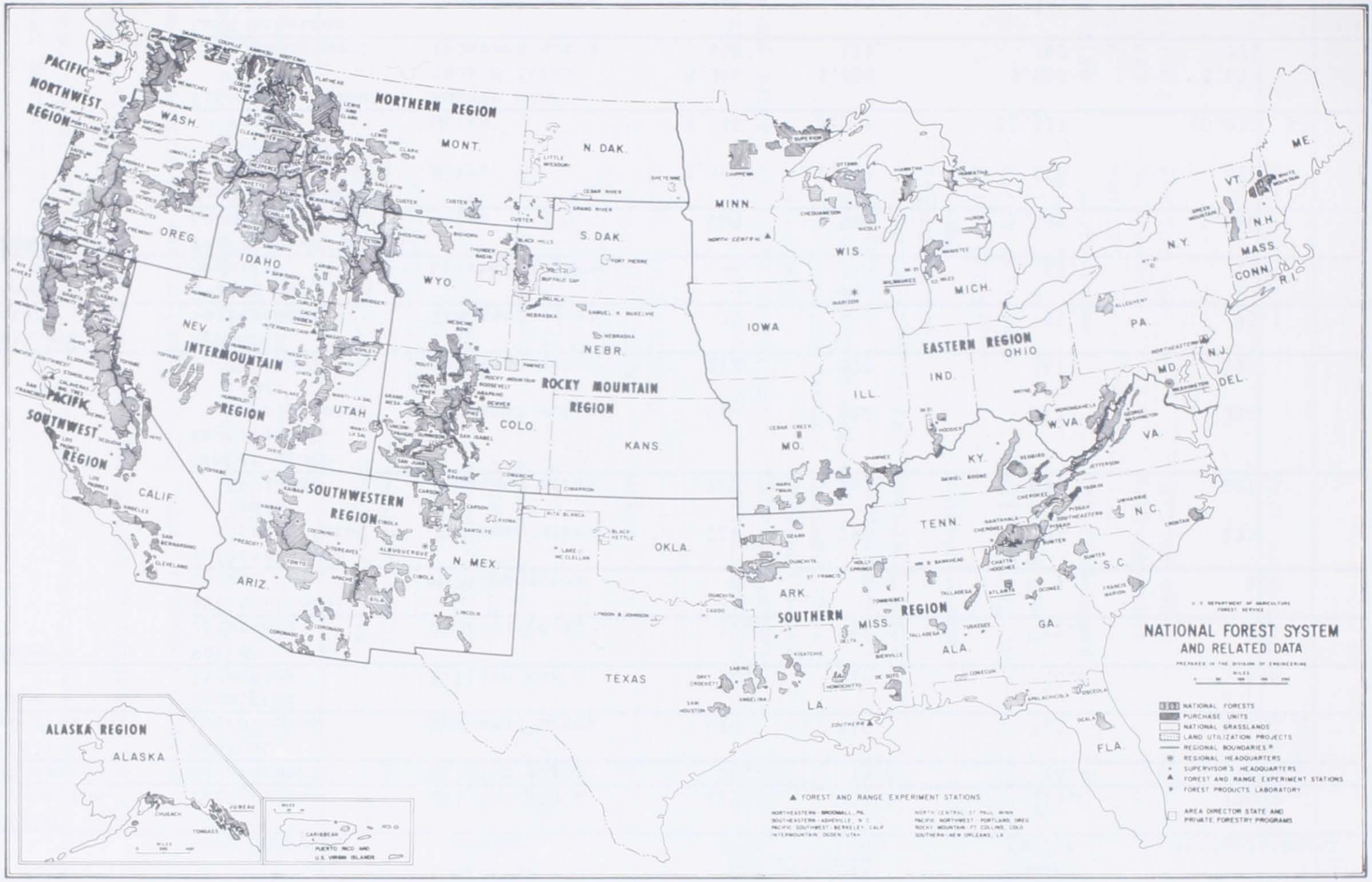


Figure 1.--National Forests and other lands administered by the Forest Service.

Table 1.--Summary of National Forest System key output accomplishments compared to RPA estimates and funded targets--fiscal year 1979

	(Key output)	Unit of measure	RPA estimate High	RPA estimate Low	Funded target	1/ Accomplishment
RESOURCE						
Recreation	Visitor use	Million RVD's	219.7	203.8	213.0	220.2
Wilderness	Maintenance	Million acres	15.2	15.2	16.3	18.1
Wildlife and fish	Habitat improvement	Thousand acres	870	810	795	974
Range	Permitted livestock	Million AUM's	10.8	10.3	10.0	8.8
Timber	Sales offerings	Billion bd ft	15.3	14.2	12.4	12.4
	Silvicultural exams	Million acres	8.7	8.7	7.3	9.0
	Reforestation					
	Appropriated funds	Thousand acres	314	290	206	225
	KV funds	Thousand acres	263	263	253	221
	Timber stand improvement					
	Appropriated funds	Thousand acres	674	622	312	324
	KV funds	Thousand acres	272	272	161	153
Soil and water	Resource improvement	Thousand acres	75	75	35.1	35.7
Minerals	Leases and permits	Operating plans	--	--	15.7	11.7
SUPPORT	Trail construction/ reconstruction	Miles	980	980	1,499	1,848
	Road construction					
	Appropriated	Miles	2,297	2,197	626	820
	Purchaser credit	Miles	8,188	5,558	12,317	10,032 3/
	Fire prevention	Number man-caused fires	6,344	5,856	5,053	5,053
	Fuel management	Thousand acres	440	111	360	375
	Land acquired and exchanged	Thousand acres	244.4	225.6	165.2	146.1
	Landline location	Thousand miles	4.3	4.0	5.8	6.7

1/ Accomplishments by participants in the human resource programs are included.
2/ Accomplishment includes 1,179 miles turned back by timber purchasers to Forest Service for construction.

Table 1A--Summary of National Forest System key output accomplishments and costs 1/

	Key output	Unit of measure	Accomplishment 2/	Dollars 3/ (Thousand)
RESOURCE				
Recreation	Visitor use	Million RVD's	220.2	89,101
Wilderness	Maintenance	Million acres	18.1	5,200
Wildlife and fish	Habitat improvement	Thousand acres	974	29,743
Range	Permitted livestock	Million AUM's	8.8	32,733
Timber	Sales offerings	Billion bd. ft.	12.4	136,882
	Silvicultural exams	Million acres	9.0	22,730
	Reforestation			
	Appropriated funds	Thousand acres	225	46,768
	KV funds	Thousand acres	221	53,652
	Timber stand improvement			
	Appropriated funds	Thousand acres	324	34,502
	KV funds	Thousand acres	153	17,666
Soil and water	Resource improvement	Thousand acres	35.7	36,587
Minerals	Leases and permits	Operating plans	11.7	12,271
SUPPORT				
	Trail construction/ reconstruction	Miles	1,848	8,436
	Road construction			
	Appropriated		820	214,468
	Purchaser credit		10,032 4/	243,466
	Fire prevention	Number person-caused fires	5,053	19,941
	Fuel management	Thousand acres	375	14,818
	Land acquired and exchanged	Thousand acres	146.1	5,292
	Landline location	Thousand miles	6.7	17,473

1/ The costs shown are total available dollars for the budget line item include both the management and investment. The figures do not include support dollars included in other budget line items.

2/ Accomplishments by participants in the human resource program are included.

3/ These figures were taken from the 1981 Budget Explanatory Notes.

4/ Accomplishment includes 1,179 miles turned back by timber purchasers to Forest Service for construction.

RPA recommended increasing the supply of outdoor recreation opportunities and services through Forest Service programs that emphasize dispersed recreation--activities that occur outside of sites developed or managed to concentrate recreation use. Under this program, dispersed recreation would increase in the next two decades. The program also called for the Forest Service to maintain its share of developed or concentrated site recreation.

The recreational activities in the National Forests are varied and range from camping in constructed facilities through exhibits and talks provided by the Visitor Information Service (VIS) (appendix tables C 2 and C 3). Highlights of these activities are discussed in the following text.

Dispersed Recreation Areas Use

RPA dispersed recreation outputs for 1979 were expected to range between 129 and 140 million visitor-days. Although actual use in fiscal year 1979 fell within the projected RPA range, there was a slight drop of 0.4 percent from fiscal year 1978. Approximately 138.3 million visitor-days of use were recorded (appendix tables C 4 and C 5). This is the first time since the mid-1940's that any decrease in dispersed use was recorded. Leveling off can be attributed to the short fuel supply during the early summer recreation season.

Developed Recreation Sites and Facilities Use

In fiscal year 1979, 81.9 million visitor-days of recreation use occurred on National Forest developed sites (appendix tables C 6 and C 7). This is slightly higher than the fiscal year 1979 RPA estimate (table 1). This indicates the general public is turning to the National Forests for outdoor recreation in ever-increasing numbers.

These visitors were accommodated at 4,802 campgrounds (89,954 family camping units), 1,531 picnic sites (21,343 family picnic units), 311 swimming sites, 963 boating sites, 637 interpretive and information sites, 464 observation sites, and 199 other sites operated by the Forest Service. Much use also occurred at winter sports areas, organization camps, lodges and resorts, and other concessions authorized by special use permit.

A full level of services was provided at many sites, but the majority of the sites were operated at a reduced level of services. Reduction of services at selected areas allowed us to keep all sites open to serve the recreation visitor.

Recreation users paid fees at 1,911 sites. Total fees amount to about $7 million. They range from $1 to $5 per day per camp unit.

The major thrust of recreation construction was toward rehabilitating existing unsafe or unsanitary facilities. New construction will provide facilities that will accommodate an additional 4,000 people at one time.

Figure 2 shows the total funding recommended in the RPA program and the funds appropriated for recreation use. Every effort has been made to educe costs and conserve funding.

Recreation use is close to the high RPA project targets (figure 3). This exemplifies the increasing popularity of outdoor recreation in the National Forests.

As Americans look for more energy efficient forms of recreation they are turning in increasing numbers to the National Forests. A survey conducted in 53 National Forests in August 1979 showed that people are visiting National Forests closer to their homes; they are staying at one place longer; group and weekday use is increasing; and people who were formerly "weekend" campers are spending entire vacations in the National Forests.

HOST Program

The purpose of the HOST program is to provide responsive service to the public. Implementation of the program was accelerated in fiscal year 1979.

Eight areas of interaction with the public were identified: telephone, personal, office operations, signs, publications, mass media, correspondence, and office design and location. Minority business contracts were signed to develop training modules in these areas. The training will be directed at all employees including seasonals, Human Resource Program enrollees, and permittees who provide direct services to the public.

A review of existing policies and procedures will continue to see if they are in keeping with the objective of responsive public service. Additionally, responsive public service will be incorporated into performance standards for persons in key public contact positions.

Off-Road Vehicle Management

In compliance with Executive Order 11644 (February 8, 1972) (as amended by E.O. 11989, May 24, 1977), initial off-road vehicle (ORV) management plans were implemented on 98 percent (183.9 million acres) of National Forest System lands. Off-road vehicle controls on selected portions of the remaining 2 percent (3.5 million acres) are pending resolution of ORV plan appeals or the incorporation of ORV plans into forest land management plans.

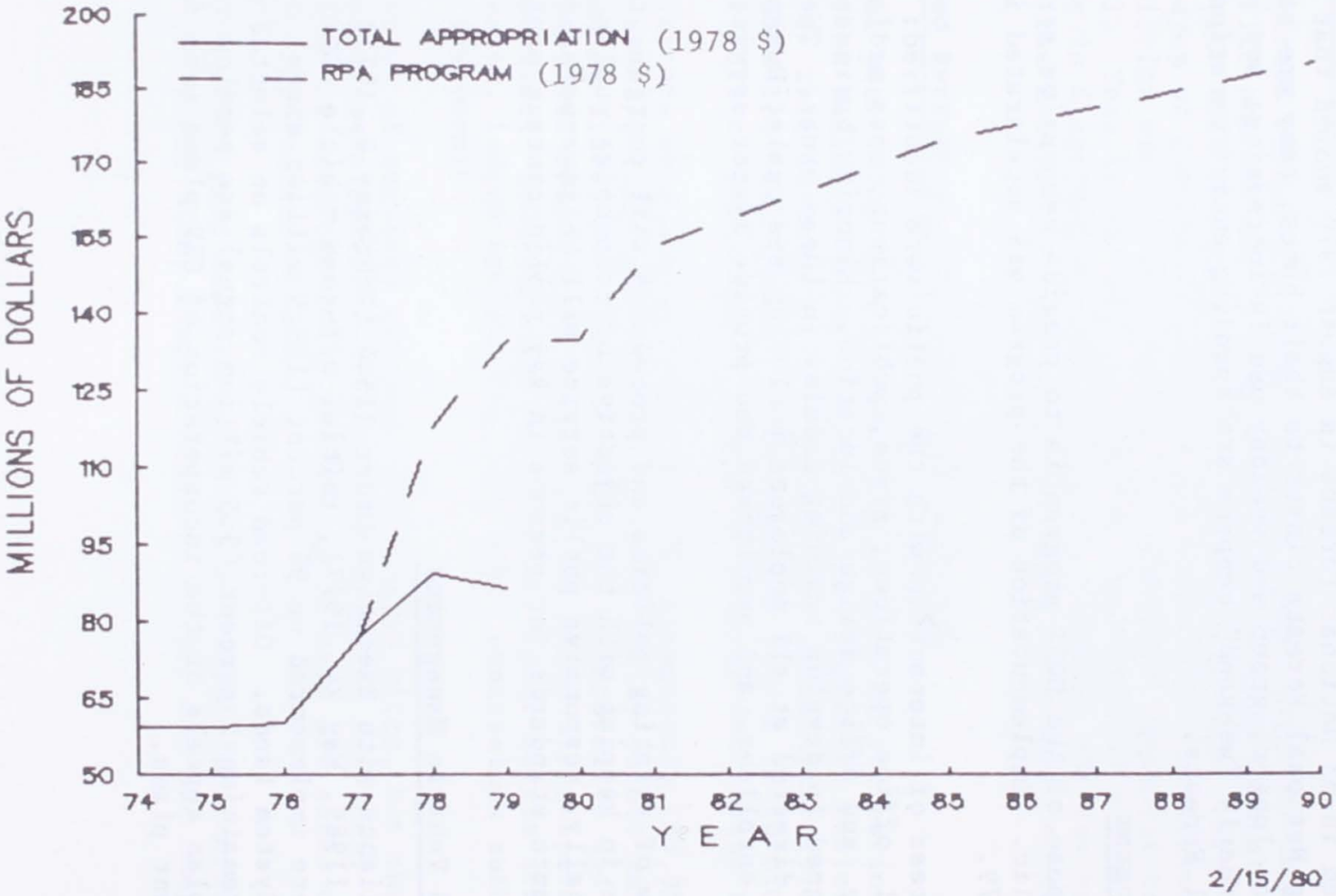


Figure 2.--Comparison of annual recreation funding and the RPA program.

RECREATION USE – DEVELOPED AND DISPERSED

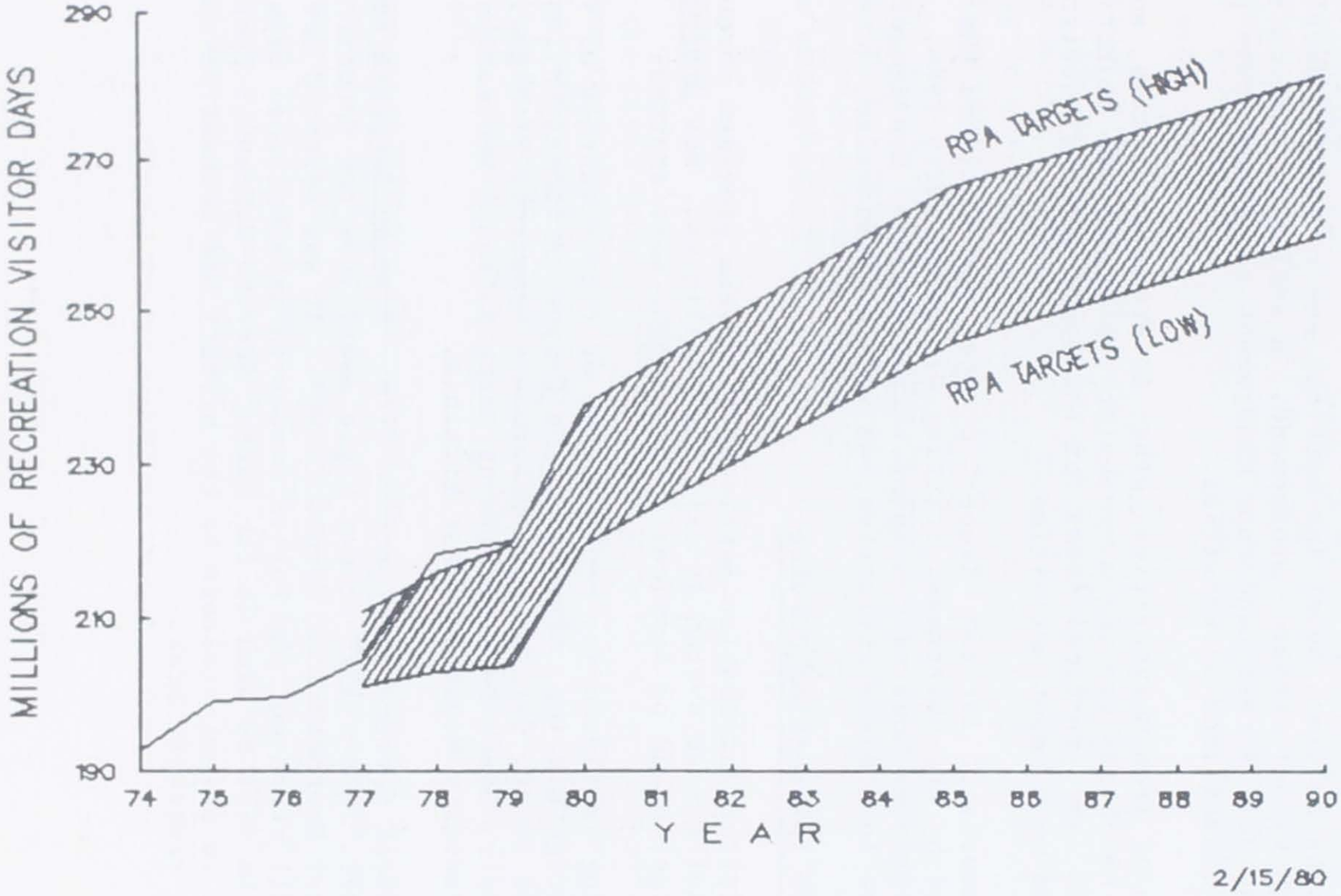


Figure 3.--Comparison of annual recreation use and the RPA projected targets.

The status of National Forest ORV management designations for 1979 is:

- 122.9 million acres (66 percent) designated open to ORV use (includes 64.5 million acres that are not suitable to be used by ORV's because of topography, vegetation, or other natural barriers.

- 24.5 million acres (13 percent) restricted by plans to specific vehicle types or seasons of use.

- 40.5 million acres (21 percent) closed to all ORV use (includes approximately 18 million acres of wilderness).

Visual Resource (Landscape) Management

The Forest Service predesigns the aesthetic effects of timber harvests, road construction, powerline routing, and recreation developments through visual resource management. A series of publications called the National Forest Landscape Management series has been prepared and is in demand from universities.

In demand from universities, other Government agencies, and the public. These handbooks provide a vocabulary, planning and objective setting process, and practical ideas for the application of design principles to land management activities.

The manuscript for the "Timber" chapter was completed and will be printed by the Government Printing Office in early 1980. It will illustrate methods of combining visual resource management with silviculture to achieve attractive, as well as productive, forest landscapes.

Visitor Information Service

The Visitor Information Services (VIS) were provided throughout the National Forest System at existing facilities. New programs of visitor orientation and of services to management were started.

Planning continued for construction or reconstruction of VIS facilities at Protage Glacier, Alaska; Sabino Canyon, Arizona; Chilao on the Angeles Crest, California; Lumberman's Monument, Michigan; Pactola Reservoir, South Dakota; Flaming Gorge National Recreation Area, Utah; and Cranberry Mountain, West Virginia.

The Forest Service interpretive film, "Flaming Gorge--A Story Written in Water," won a 1979 Golden Eagle Award from the Council on International Nontheatrical Events (CINE). It was selected for excellence and will represent the United States in international film festivals. The film will be used in the Forest Service-Bureau of Reclamation visitor center to orient visitors to the history and recreation opportunities of the reservoir area.

Cultural Resource Management

The cultural resource management activity expanded and matured during the past year. Although the RPA program did not establish specific program goals for cultural resource management, the program has developed to implement the requirements of the National Historic Preservation Act, National Environmental Policy Act, Executive Order 11593 (May 13, 1971) and U.S. Department of Agriculture regulations (7 CFR 3100).

During the past year, a position was established and filled for a Cultural Resource Management Specialist Coordinator to provide leadership to the field. Direction is provided to the nearly 100 cultural resource specialists including archaeologists and historians at the Regional and Forest levels.

To protect and manage the cultural resource, the Forest Service is required to identify, evaluate, and mitigate adverse effects on those resources prior to any ground disturbing activities. The cultural resource program integrates with other activity areas such as timber, lands, range, and minerals to insure that protection is an integral part of all activities.

The new National Forest Management Act (NFMA) regulations and U.S. Department of Agriculture cultural resource regulations requires that cultural resources be considered in the earliest stages of land management planning to ensure resource protection, compliance with the law, and the best and most efficient use of all resources.

During fiscal year 1979, Forest Service procedures were developed and published in draft form as a counterpart to the regulations of the Advisory Council on Historic Preservation. They will be revised to consider the extensive public comment and published in final form during fiscal year 1980.

Trails Management

The goal of the trail management program is to develop and maintain a trail system that provides a full spectrum of trail-related recreation opportunities commensurate with land capability and public need. The RPA goal is a system of 120,000 miles of trail within the National Forests by 2020. At the end of fiscal year 1979, there were 98,000 miles of trail.

National Recreation Trails. The President's Environmental Message for 1979 reaffirmed the Forest Service goal to have 244 National Recreation Trails by January 1, 1980. This goal was exceeded by 12 for a total of 256 trails. In fiscal year 1979, 146 new National Recreation Trails were designated. At the end of the year, 68 additional trails were still undergoing interagency review.

National Scenic Trails. The goal is to complete the Appalachian National Scenic Trail through the National Forest System by 1981. The Pacific Crest National Scenic Trail will be completed by 1986. The status of the trails is:

	Total miles planned	Miles to standard	Miles of private land to secure
Appalachian Trail	840	760 1/	20
Pacific Crest Trail	2,600	1,983 2/	375

1/ 31 miles were constructed or reconstructed in fiscal year 1979.
2/ 213 miles were constructed or reconstructed in fiscal year 1979.

Recreation Special Use Permits

Suitable National Forest lands are made available to private concessioners to devlop commercial accommodations providing recreation services to the visiting public. Operating under special use permits, these concessioners offer a variety of recreation opportunities and services.

Approximately 3,000 commercial permittees including, ski area operators, lodges, marinas, stores, restaurants, integrated resorts (those providing a combination of services), and outfitters and guides paid fees amounting to about $5 million to the United States for their operating privileges in 1979.

Individuals and families are authorized to use National Forest lands for vacation cabin purposes. In 1979, over 17,000 recreation residence permittees paid fees of about $3 million to the United States for the privileges they enjoyed.

The Forest Service makes suitable land available for organized groups to develop and operate camps and conduct activities in a wholesome outdoor environment. In 1979, the Forest Service administered over 500 permits to accommodate a variety of youth, religious, and civic groups in providing group-oriented recreation activities.

In administering these 20,000 special use permits, the Forest Service works cooperatively with permittees and makes periodic inspections to confirm that authorized activities are conducted in conformance with the permit provisions and to ensure protection of the environment and the health, safety, and welfare of the general public.

Wild and Scenic Rivers

Prior to 1979, Congress designated 11 Wild and Scenic Rivers within the National Forest System. In 1979, four additional units encompassing about 129 miles (46,700 acres) were added to the Wild and Scenic River System (table 2). This brings the total to 15 rivers involving about 886 miles (238,900 acres) of designated rivers within the National Forest System.

It is estimated that recreational use of Wild and Scenic Rivers totaled about 1.2 million visitor-days in 1979. This is an increase from the 1978 estimated use of 1.1 million visitor-days.

The RPA program did not single out Wild and Scenic River management. This was included in the overall recreation management goals.

Table 2.--Additions to the National Wild and Scenic Rivers System Congressionally Designated in fiscal year 1979

River	P.L. No.	Forest	State	Date	Miles
Pere Marquette	95-625	Huron-Manistee	Michigan	11/10/78	11
Skagit	95-625	Mt. Baker-Snoqualmie	Washington	11/10/78	25
North Fork American	95-625	Tahoe	California	11/10/78	26
St. Joe	95-625	St. Joe	Idaho	11/10/78	67
					129 1/

1/Total reflects National Forest portion only.

Wilderness

During the year, about 475,000 acres of National Forest System land were added to the National Wilderness Preservation System (NWPS) by Congressional action (table 3). Legislation established 4 new Wildernesses and increased 2 established Wildernesses. The National Forest portion of the Wilderness System now totals 15,257,135 acres in 110 units. This represents 80.2 percent of the total 19.0 million-acre NWPS and about 8 percent of the National Forest System.

The RPA program projected 15.2 million acres of designated Wilderness within the National Forest System by 1980 and 25 to 30 million acres by 2020.

On April 16, 1979, the Administration recommended to Congress designation of an additional 15.4 million acres of Wilderness as a result to the Roadless Area Review and Evaluation (RARE II).

Wilderness visits in 1979 totaled about 9.6 million visitor-days. This is an increase from the 8.6 million visitor-days in 1978. The RPA estimate for 1979 was 7.1 million visitor-days. The increase was 35 percent more than the RPA estimate.

The status of the National Forest units of the NWPS is reported annually by the Secretary of Agriculture. The Fifteenth Annual Report (as of 12/31/78) was transmitted to Congress by the President and details the wilderness management situation.

Table 3.--Additions to the National Wilderness Preservation system Congressionally Designated in fiscal year 1979

Area	P.L. No.	Forest	State	Date	Acres
Indian Peaks	95-450	Arapaho-Roosevelt	Colorado	10/11/78	70,000
Blackjack Springs	95-494	Nicolet	Wisconsin	10/21/78	5,886
Whiskey Lake	95-494	Nicolet	Wisconsin	10/21/78	7,315
Boundary Waters Canoe Area Addition	95-495	Superior	Minnesota	10/21/78	45,500
Great Bear	95-546	Flathead	Montana	10/28/78	285,771
Bob Marshall Addition	95-546	Lewis and Clark	Montana	10/28/78	60,000
					474,472 1/

1/Four new wildernesses = 368,972
Two additions = 105,500
474,472

TIMBER MANAGEMENT

Introduction

National Forest System timber is managed to produce a continuous flow of wood products to serve America's many demands.

Timber Sales Offerings

The $155.2 million sales administration and management program (figure 4) accomplished the 12.4 billion board feet timber sales target (figure 5) as funded by Congress. The RPA projected targets for 1979 were 14.1 to 15.2 billion board feet. The reduction in land base and changes in land designations are major barriers in meeting the RPA program.

A total of 11.3 billion board feet of timber was actually sold at a value of $1,962 million, while 10.4 billion board feet was harvested at a value $968 million (table 4). In addition, 0.5 billion board feet were prepared and released for cutting on previously sold long-term sales. Appeals and court actions challenging land use and timber plans and planned timber sale offerings continue to have major impacts on target accomplishments.

The demand for National Forest timber sales remains high throughout the Nation except in the Rocky Mountains and Northeast where the demand has softened on some forests during the last half of fiscal year 1979. The "Pilot Salvage Sale Program" initiated for small loggers, 25 employees or less, resulted in 52 million board feet sold under the program during fiscal year 1979.

Stumpage rates have been increasing sharply in the past several years. The average national stumpage rate per thousand board feet for volume sold was $68 in 1976, $100 in 1977, $121 in 1978 and $173 in 1979. These rates are actual dollar values per the respective fiscal year.

In fiscal year 1979, 700,000 free-use firewood permits were issued for a total volume of 3.2 million cords--the equivalent of an estimated 7 million barrels of oil use. This program is extremely popular with a 33 percent increase over fiscal year 1978. The demand is straining the ability to meet all requests on some Forests, especially near populated areas.

Interdisciplinary reviews, improved silvicultural practices, water quality monitoring, advanced logging systems, and closer contract administration continued to improve the environmental quality of the timber sales program during fiscal year 1979. At the same time, the per unit value of volume sold increased 43 percent over that of fiscal year 1978.

Silvicultural Examination

Silvicultural examination was funded for 7,297,000 acres and 8,951,000 acres were completed. The objective is to get site-specific prescriptions for for all lands needing treatment. Most timber activities, reforestation, timber stand improvement and sales preparation are based on the data

collected during examinations. Inventory data used in the land management planning process is also a product of silvicultural examinations.

As a minimum, each stand will be examined on a 10-year cycle and the prescription revised to keep pace with changing conditions and management needs.

Timber Resource Planning

In addition, considerable effort was expended in developing proposed planning regulations to implement the National Forest Management Act of 1976. Regulations were proposed (published in final form in the Federal Register) covering departures from nondeclining evenflow, intensive forest management, silvicultural guidelines, and guides for determining allowable sale quantities and long-term sustained yield capacity.

Reforestation and Timber Stand Improvement Program Accomplishments

Reforestation of 225 thousand acres and timber stand improvement (TSI) on 324 thousand acres were accomplished with appropriated funds during FY 1979 (table 5). The funded goal was exceeded by 9 percent in reforestation and 2 percent in TSI. Part of this accomplishment resulted from the use of carry-over funds from the previous year. Not all of the FY 1979 funds were obligated, but will be used during FY 1980 to complete some of the silvicultural work already planned.

With Knutson-Vandenberg Act (K-V) funds, 221 thousand acres out of a targeted 253 thousand acres of reforestation were accomplished (table 5). Also for TSI, 153 thousand acres of the targeted 161 thousand acres were accomplished; 90 percent overall. The short fall is primarily a result of uncompleted timber sales, but herbicide restrictions and inflation have taken a toll. The K-V funds not obligated will be carried over to FY 1980 for programing.

In addition to the accountable acres listed above, support work to insure the success of the reforestation and TSI job was completed as follows:

Site preparation for planting and seeding	191,406 acres
Animal control	100,266 acres
Prescribed burning	40,961 acres

The reforestation program funding and accomplishments are graphically displayed in figures 6 and 7 respectively. Figures 8 and 9 display the same data for the timber stand improvement program. The large increases in both programs reflect the RPA estimates of large backlogs of work needed. Subsequent detailed planning, surveys, and compartment examinations have identified less backlog than the original estimates. The change is reflected in the past and current program levels (appendix tables C 9 and C 12).

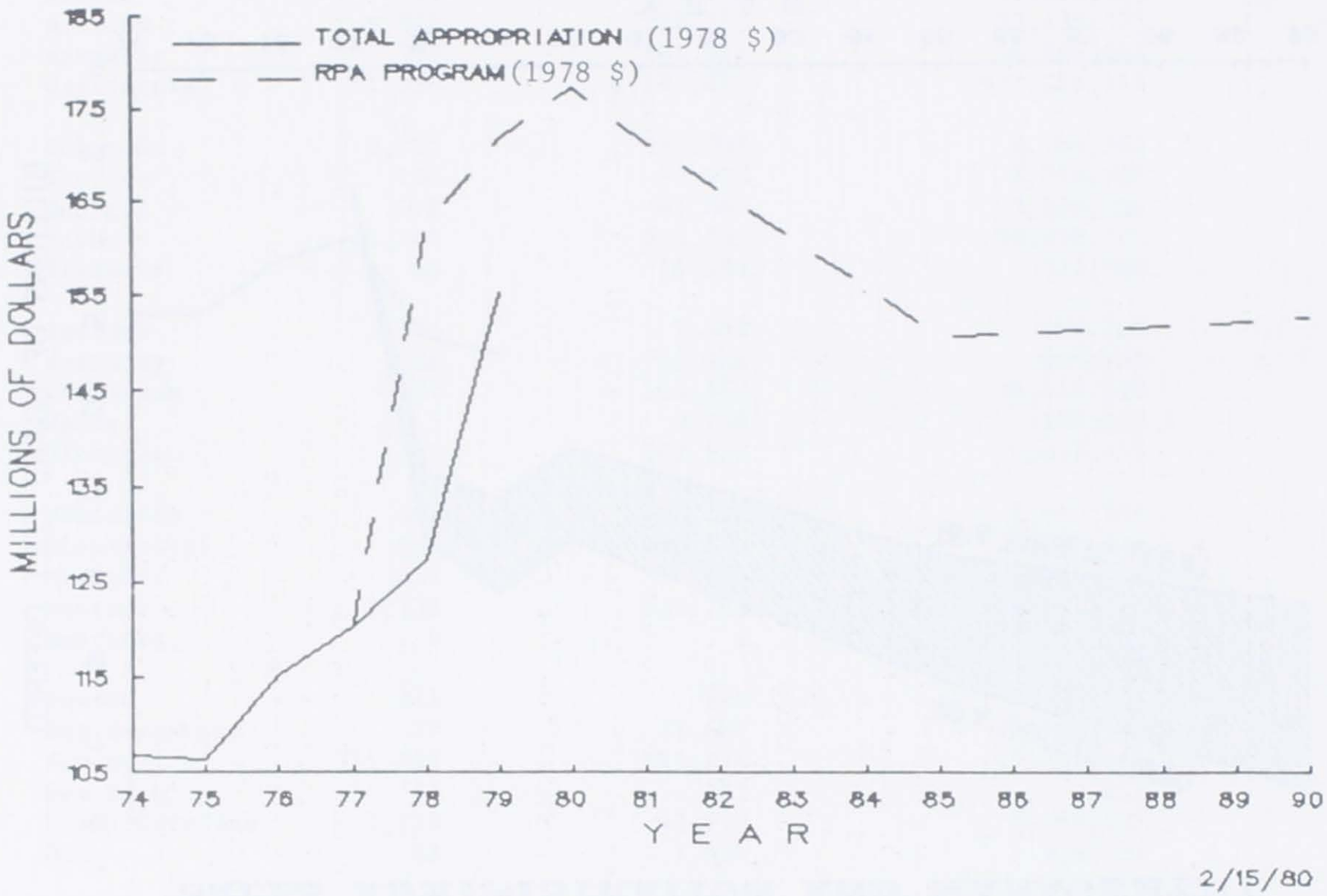


Figure 4.--Comparison of the annual timber administration and management funding with the RPA program.

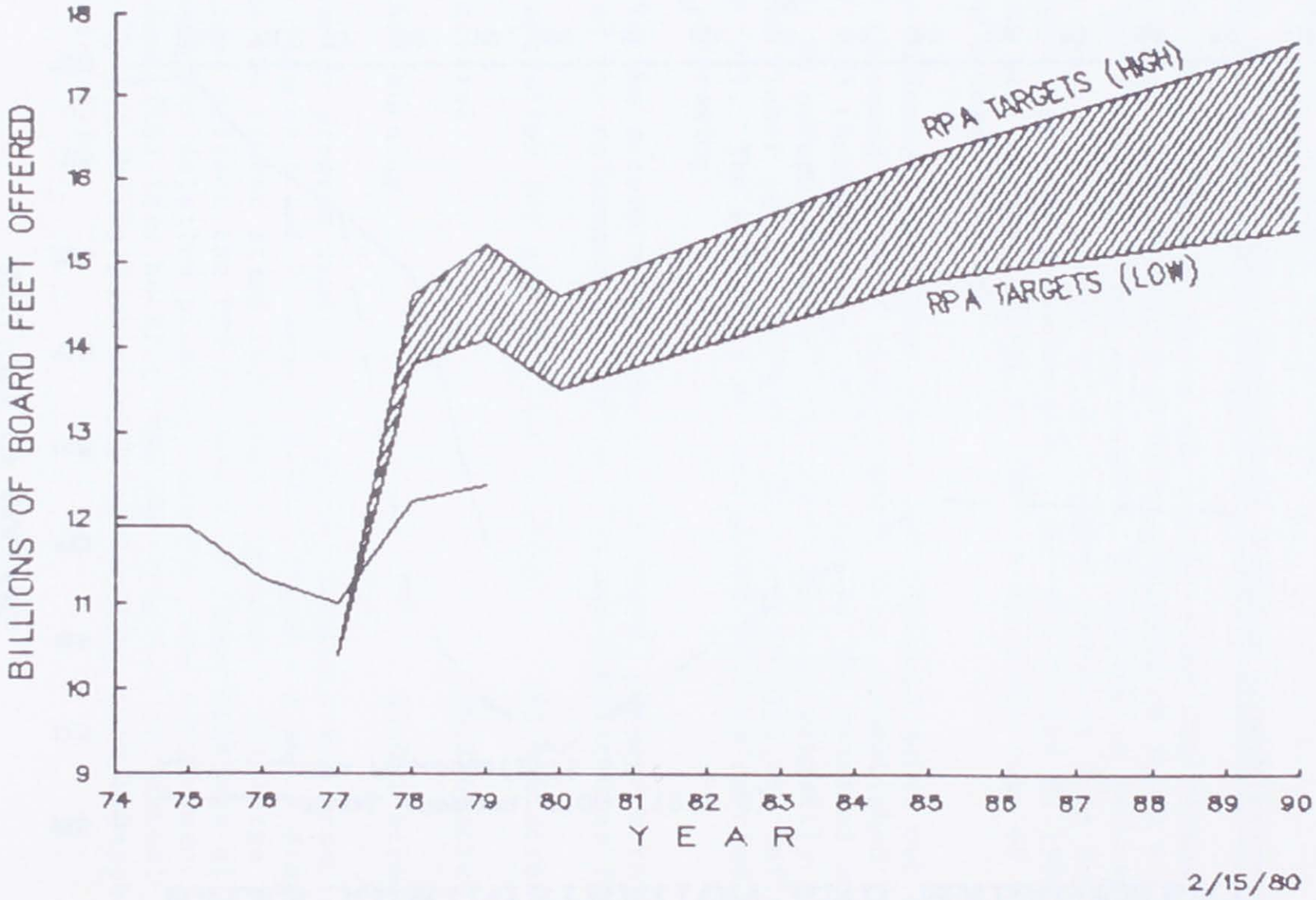


Figure 5.--Comparison of the annual timber volume offered with the RPA projected targets.

Table 4.--Timber sold and harvested on National Forest System lands by States--fiscal year 1979

State or Territory	Timber sold			Timber harvest	
	Sales	Volume	Value	Volume	Value
	number 1/	MBF 2/	dollars	MBF 2/	dollars
Alabama	316	72,334	$5,827,711	47,915	$2,666,751
Alaska	19	109,101	11,191,435	430,379	1,475,188
Arizona	9,828	222,335	23,435,571	210,664	16,300,695
Arkansas	707	181,822	14,866,444	187,246	9,779,861
California	11,266	2,182,467	437,211,116	1,833,436	187,275,327
Colorado	2,125	153,703	1,104,592	127,590	1,645,546
Florida	130	97,678	4,724,998	98,838	4,042,859
Georgia	378	63,865	3,838,126	61,704	3,236,582
Idaho	4,182	828,133	52,950,771	891,229	43,900,218
Illinois	48	10,036	331,386	2,207	73,949
Indiana	60	7,505	402,268	7,433	293,977
Kentucky	124	26,988	483,189	18,859	440,630
Louisiana	337	154,167	18,417,923	147,571	9,843,124
Maine	5	9,130	125,259	1,420	6,743
Michigan	780	162,627	3,029,425	173,755	2,244,774
Minnesota	307	123,001	1,755,969	145,790	1,310,321
Mississippi	562	209,315	21,731,935	194,060	14,391,519
Missouri	661	55,859	2,223,318	46,179	1,502,738
Montana	2,332	532,743	30,508,410	451,099	27,652,714
Nebraska	0	0	0	0	0
Nevada	313	914	3,025	665	2,676
New Hampshire	77	22,667	440,573	23,376	419,300
New Mexico	11,298	143,074	11,438,685	128,097	7,440,604
New York	51	223	9,211	98	925
North Carolina	1,220	47,970	1,385,996	30,816	783,839
Ohio	42	7,636	233,122	8,051	191,649

1/ Excludes sale for products that cannot be expressed in board feet.

2/ Thousands board feet.

Table 4.--Timber sold and harvested on National Forest System lands by States--fiscal year 1979 (con.)

State	Timber sold			Timber harvest	
	Sales	Volume	Value	Volume	Value
	number 1/	MBF 2/	dollars	MBF 2/	dollars
Oklahoma	99	26,094	2,607,118	13,093	524,221
Oregon	6,629	3,518,819	966,254,751	3,230,588	479,869,674
Pennsylvania	100	45,974	3,981,965	34,713	1,879,875
South Carolina	210	123,928	10,520,855	108,970	5,724,677
South Dakota	138	136,146	1,209,196	86,296	1,571,410
Tennessee	127	28,507	346,688	30,842	518,415
Texas	384	96,680	15,196,764	42,602	4,078,293
Utah	2,034	48,688	1,108,357	44,416	1,461,118
Vermont	125	11,516	296,476	7,380	139,354
Virginia	636	36,432	$388,785	31,130	308,386
Washington	4,667	1,604,994	309,171,058	1,298,057	131,426,169
West Virginia	202	15,540	478,036	4,411	146,359
Wisconsin	237	114,052	1,947,671	76,793	1,053,960
Wyoming	1,305	97,700	1,435,421	99,179	2,408,511
Puerto Rico	2	12	828	7	518
Totals	64,135	11,330,374	1,962,624,422	10,376,956	968,033,446

Table 5.--Reforestation and timber stand improvement acreages by Region--fiscal year 1979

Region	Appropriated Funds		K-V Act Funds[1/]	
	Target	Accomplishment	Target	Accomplishment
		REFORESTATION		
1	29,640	32,404	27,384	25,596
2	16,470	13,371	4,728	2,413
3	10,750	14,397	3,078	4,187
4	11,660	11,960	14,473	12,074
5	18,850	19,909	15,412	16,870
6	38,780	44,310	109,631	85,719
8	51,370	58,744	54,319	52,705
9	28,070	29,499	21,896	20,404
10	410	400	2,180	1,134
Total	206,000	224,994	253,101	221,102
		TIMBER STAND IMPROVEMENT		
1	24,800	23,233	20,700	8,654
2	20,200	23,072	17,392	16,532
3	57,440	63,002	28,582	36,558
4	10,800	12,673	8,532	8,419
5	24,800	19,683	28,275	20,360
6	83,940	76,866	27,920	38,510
8	48,220	52,884	16,525	13,474
9	44,900	49,612	9,950	7,719
10	2,900	2,775	3,400	3,079
Total	318,000	323,800	161,276	153,305

1/ Knutson-Vandenberg Act.

REFORESTATION

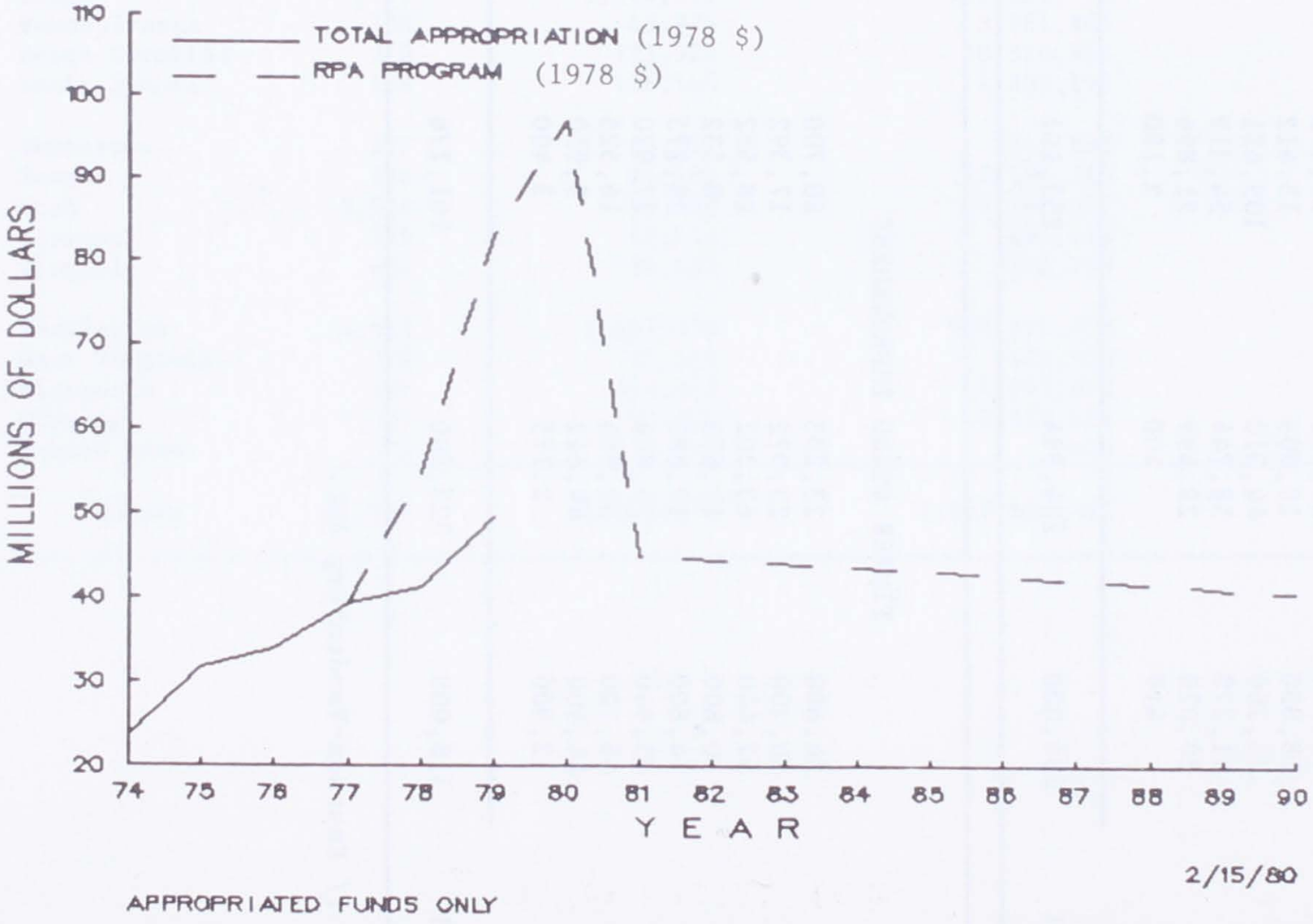


Figure 6.--Comparison of the annual reforestation funding with the RPA program.

REFORESTATION

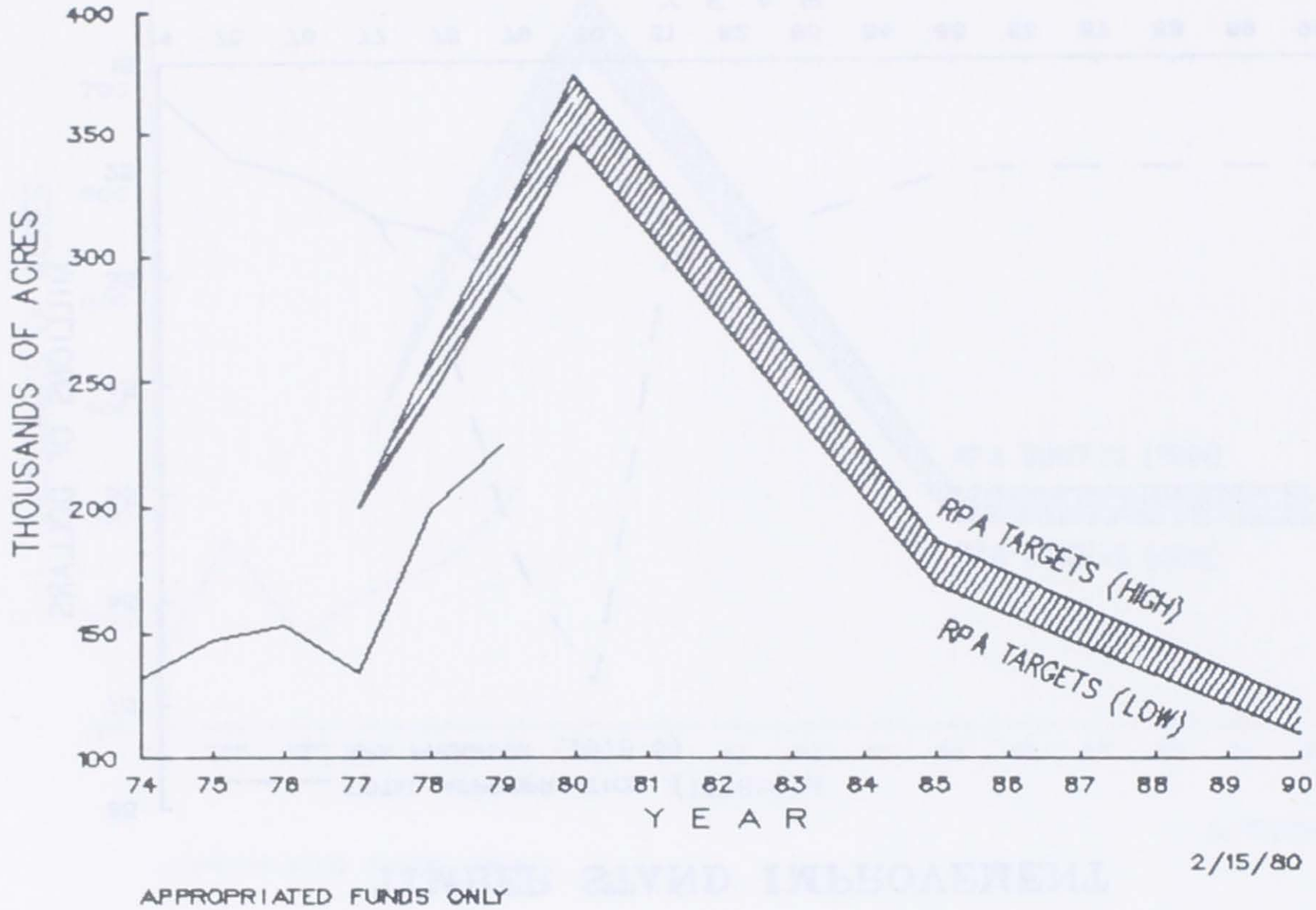


Figure 7.--Comparison of the annual reforestation accomplishment with the RPA projected targets.

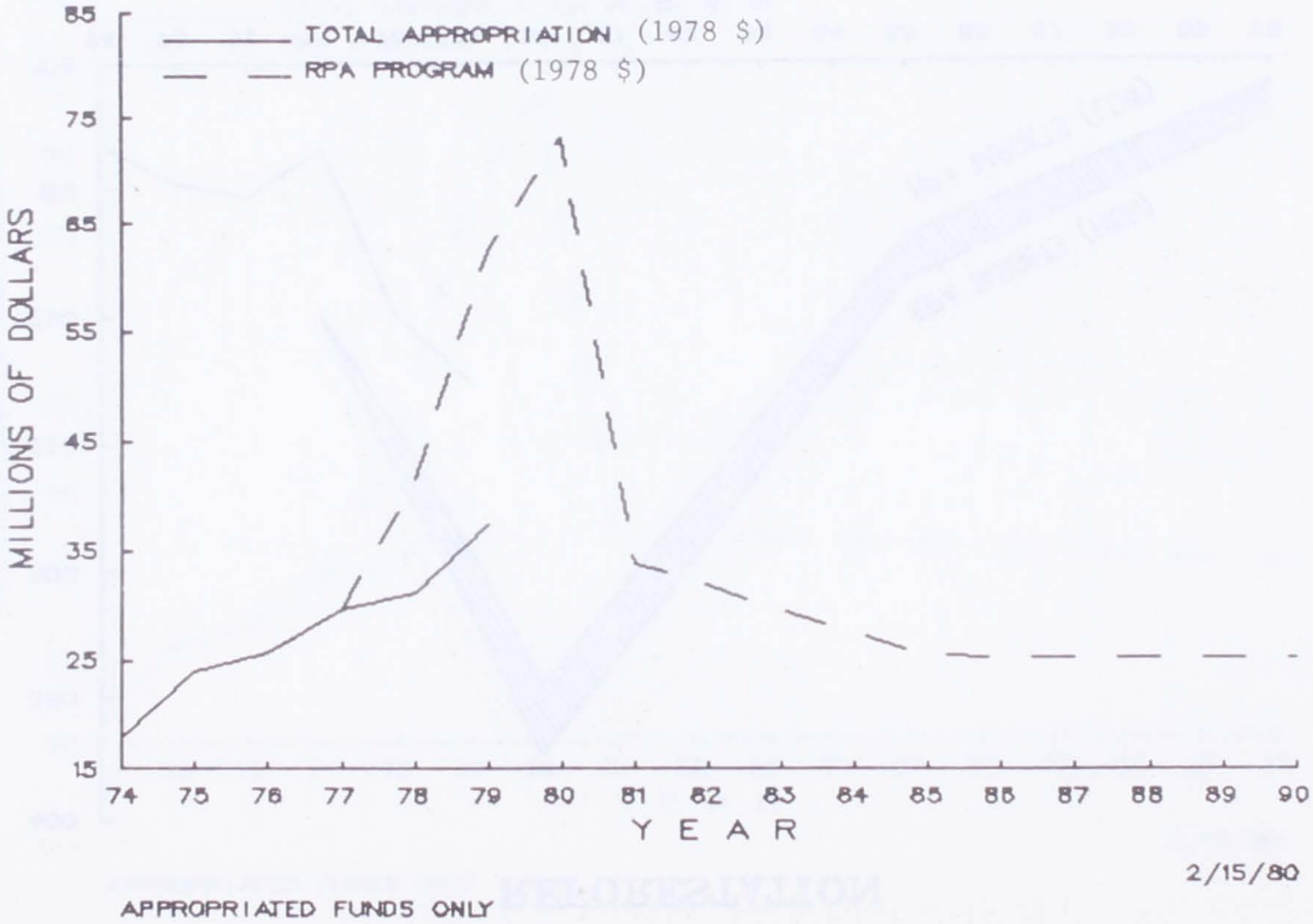


Figure 8.--Comparison of the annual timber stand improvement funding with the RPA program.

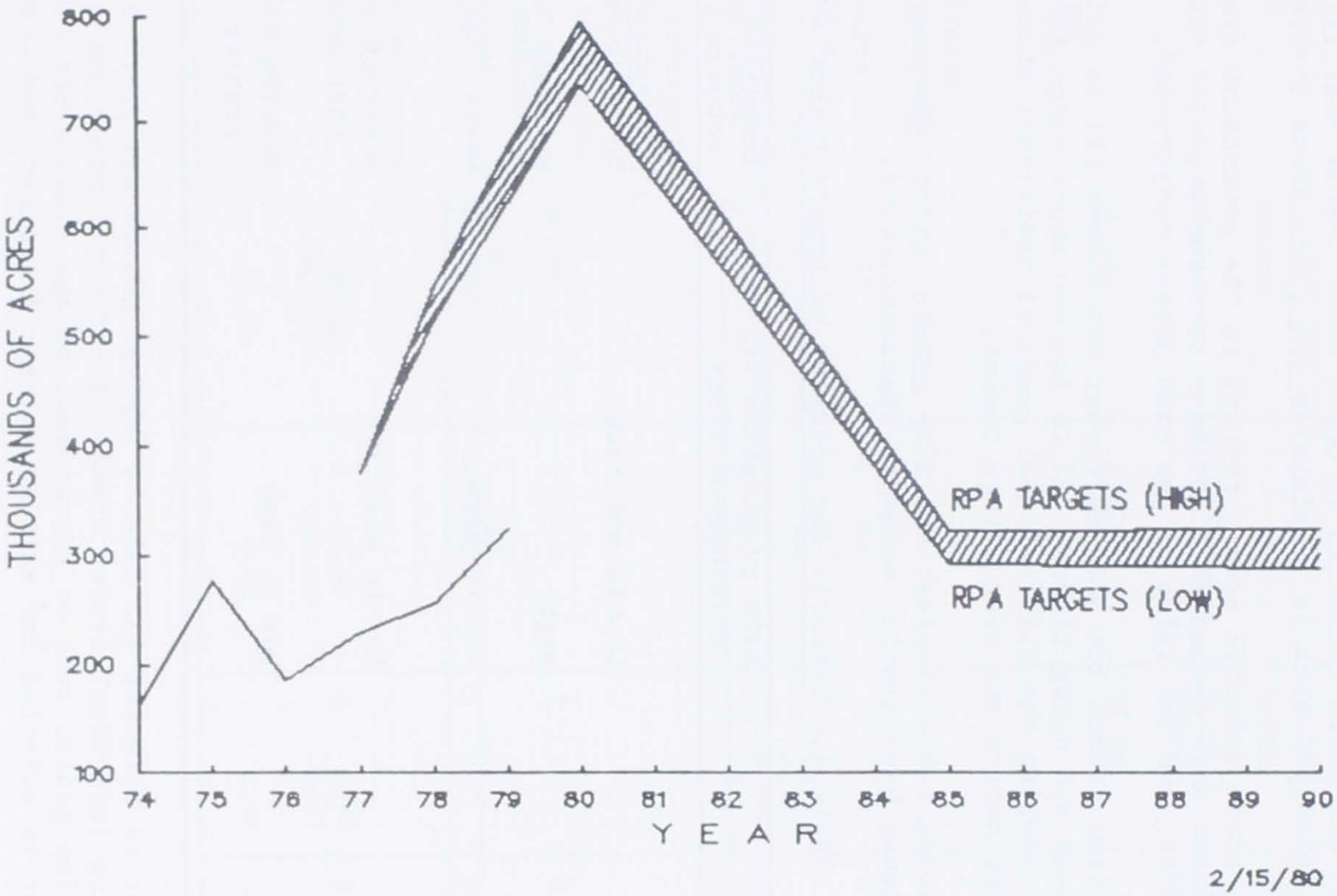


Figure 9.--Comparison of the annual timber stand improvement accomplishment with the RPA projected targets.

Sample Timber Sales

Section 6 of the Renewable Resources Planning Act requires within an annual report the "identification on a representative sample basis of those advertised timber sales made below the estimated expenditures for such timber as determined by the above cost process." The following section provides, on a sample basis, Government expenditures for timber sales sold in fiscal year 1979 and future returns to the Government resulting from the harvest of timber sold (tables 6 and 7).

For the selected sample of timber sales, all government expenditures attributable to the preparation and sale, administration of harvest, and assessment of timber volumes were identified and estimated. Included were costs that were incurred prior to fiscal year 1979, costs incurred during fiscal year 1979, and costs estimated to occur after fiscal year 1979 until the time all scheduled work is complete on the sales areas (table 7).

Also, for these selected sales, returns to the government from the harvest of the timber were estimated. Included were the expected stumpage receipts, TSI deposits, and the value of the road access constructed.

The principal reason for selling timber was either (1) to salvage through harvest dead and dying timber, (2) to improve short-range and long-term growth by meeting the silvicultural needs of individual stands of timber, or (3) harvest mature and over mature timber.

The following table displays the five general groups of sales. Those sales in each group have similar economic characteristics.

Table 6.--Criteria for grouping of sample timber sales

Group	Sale preparation and development costs	Immediate (short-range) returns to government
One 1/	Low to moderate	Moderate to high
Two 1/	High	Moderate to high
Three 2/	Low to high	Lower than costs
Four 1/	Low to moderate	Moderate and greater than costs
Five 1/	Low to high	Usually minimum and greater than costs

1/ Timber is selected for sale to improve growth and yield of the Forest by meeting individual timber stand silvicultural needs and working circle planning goals, such as improvement of age class distribution.
2/ Timber is selected for sale to salvage distressed and dead timber.

Table 7.--Expenditures and returns of sample timber sales--fiscal year 1979

	GROUP				
	One	Two	Three	Four	Five
	Improve Growth & Yield		Salvage	Improve Growth & Yield	
Region	Pacific NW	Intermountain	Northern	Southern	Southwest
National Forests	Mt. Baker-Snoqualmie	Boise	Clearwater	Francis Marion	Lincoln
Sale name	Alpine	Pole Creek	Sneak Creek	Witherbee 86	Horse
Volume sold (thousand board feet)	16,200	7,943	14,000	1,651	237
Government expenditures ($ in thousands)					
Timber resource	$ 140	$ 65	$ 77	$ 9	$ 3
Transportation system	175	339	15	105	0
All other resources	19	1	3	1	1
Total expenditures	$ 334	$ 405	$ 95	$ 115	$ 4
Returns to government ($ in thousands)					
Stumpage receipts and stand improvement deposits	$4,688	$1,843	$ 27	$ 209	$ 14
Value of constructed road access	905	180	65	76	0
Total returns	$5,593	$2,023	$ 92	$ 285	$ 14
Average per thousands board feet ($):					
Expenditures	$ 20.62	$ 50.99	$ 6.79	$ 69.55	$ 16.87
Returns	345.25	254.69	6.57	172.62	59.07
Return/expenditures ratio	16.75	4.99	0.97	2.48	3.50

Reforestation and Stand Improvement

Reforestation. As of October 1, 1979, an estimated 1,639,000 acres of National Forest lands needed to be reforested. These needs result from harvesting mature stands of timber; natural disasters such as fire, storms, insects, and diseases; and previous seeding, planting, or natural regeneration failures. Such needs accrue continually over the years. The Forest Service meets those needs through seeding, planting, and preparing sites to encourage natural regeneration when that is the management prescription. Some areas regenerate naturally without requiring cultural or other special management actions and investments. Each year the estimate of needed reforestation changes as accomplishments are reported and new additions occur as a result of timber harvests and other factors.

A substantial part of the needed reforestation stems from a "backlog" of such work that has existed for many years. For example, on October 1, 1979, this totaled an estimated 882,000 acres. About 316,000 acres of that cannot be programed for reforestation until after 1985, because of lack of access, incomplete land management planning (RARE II further planning areas are one illustration), constraints on herbicide use, economic, or other factors. Projected accomplishments indicate that by 1985, about 566,000 acres of that long-standing need will be accomplished. It is possible that some of the remaining 316,000 acres may never need to be programed because of natural regeneration during the waiting period, land classification decisions, or other factors.

During the July 1, 1975, to October 1, 1979, period, there was an additional increase of reforestation needs estimated to be 757,000 acres.

For planning purposes recent experience serves as a guide. When the existing carryover or "backlog" work is completed, the reforestation needs are expected to level off at about 1 million acres. This indicates a continuing reforestation program of about 400,000 acres per year. There is usually a 2- to 3-year lag between the time a harvest or other event occurs and the time the existing reforestation can be accomplished. The following table indicates reforestation needs and the projected accruals through October 1, 1985. The estimates of programmed accomplishments do not represent a firm commitment for the years ahead. The specific program developed for each year will reflect new land management plans, better data, funding priorities, timber harvest schedules, and other factors.

Reforestation Opportunities - M Acres

	Programed for completion by 10/1/85			Not Programed for completion by 10/1/85			Total
	NFS	KV	Total	NFS	KV	Total	
Backlog: (pre 7/1/75)	518	48	566	310	6	316	882
Net accruals: 7/1/75-10/1/79	249	477	726	18	13	31	757
Estimated new accruals:							
10/1/79-10/1/85	518	1,019	1,537	317	596	913	2,450
Total	1,285	1,544	2,829	645	615	1,260	4,089

Table C 8 lists the reforestation needs by State, Forest, and site-productivity class. Appendix tables C 9 and C 10 provide details on reforestation needs and status of the backlog.

Reforestation work is funded by two major sources. The Knutsen-Vandenberg law (KV) provides that a portion of timber sale receipts may be used for needed reforestation work. About 55 percent of the total reforestation work needed is expected to be funded from this source during the next few years. Regular appropriations are used to finance the work needed on areas where KV funds do not apply, and sometimes to augment KV funds if necessary in specific cases.

Some reforestation work is done as a result of employment programs; the YCC, for example, accomplished about 17,000 acres in fiscal year 1979.

In fiscal year 1979, reforestation work totaled 439,401 acres. Of this, 229,000 acres were reforested with appropriated funds; this includes the contributions of YACC and other employment programs.

Reforestation work represents a capital investment opportunity. Cost effectiveness is a primary concern in planning and scheduling the work. Improvements in benefit-cost analyses, site productivity measurement, regeneration techniques, and related work are continuing efforts that influence and guide the program. Certification of lands reforested is done by periodic on-the-ground examination to verify the success of the plantation or other treatment used to establish trees on the area.

Stand Improvement. As of October 1, 1979, approximately 2,190,000 acres in the National Forests needed thinning or release treatments to improve the growth, survival, and productivity of the forests. Most of this (82 percent) occurs on lands capable of growing more than 50 cubic feet of wood per acre per year. Most of the existing timber stand improvement (TSI) needs are for thinning to reduce the stocking of trees by removing the less desirable stems. This increases the growth, improves the resistance of the remaining trees to drought, insects, diseases, and other factors, improves the quality and value of the forest, and otherwise is beneficial. About 1.7 million acres need thinning. An additional 477,000 acres need treatment to release young, desirable trees from overtopping brush or other competing vegetation.

In 1979, 325,030 acres were thinned and 117,472 acres were released. Some additional needs were identified through more intensive surveys and some reductions in the needed work were made as a result of land classification, changes in the use of the area, and other factors. The net result of all of these factors was a reduction of the total TSI needs of about 420,000 acres in 1979.

TSI needs projected for fiscal years 1980 through 1985 inclusive total about 2.8 million acres. Of this, about one-third is projected to be accomplished with KV funding. The rest will be financed with appropriated funds, with some relatively minor contribution from YACC and other employment programs.

Appendix tables C 11, C 12, and C 13 provide details, including an array of needs by states, by regions, and a projection by fiscal years for 1980 through 1985 and beyond.

Silvicultural Needs

The present estimate of silvicultural work needed is shown below. See appendix tables C 9 and C 12 for disaggregated acres and dollars by fiscal year.

Silvicultural Needs

Work needed	Appropriated		KV		Total	
	M acres	MM dollars	M acres	MM dollars	M acres	MM dollars
Reforestation						
Backlog acres	828		54		882	
MM dollars		248		18		266
Current acres	267		490		757	
MM dollars		67		130		197
Expected acres	835		1,615		2,450	
MM dollars		250		452		702
Total acres	1,930		2,159		4,089	
MM dollars		565		600		1,165
Timber Stand Improvement						
Existing acres	1,653		538		2,191	
MM dollars		245		65		310
Expected acres	548		461		1,009	
MM dollars		82		72		154
Total acres	2,201		999		3,200	
MM dollars		327		137		464

These figures are based on existing inventories and records and current costs. Costs do not include other functional assistance, WO overhead, genetic tree improvement or nursery construction, improvement or maintenance needs, or reforestation and TSI needed for other resource management purposes.

Certification of Treated Lands

Certification of lands reforested or treated to improve growth is still not approximating the acres successfully treated because of lapsed time in determining the success of the treatment. The acres certified during 1979 are summarized below. Appendix tables C 14 and C 15 contain information on acres certified by forest by State.

Work certified	Acres
Planting and seeding	190,132
Natural regeneration	118,134
Total reforestation	308,266
Release	86,611
Thinning	259,045
Other	4,790
Total TSI	350,446

RANGE MANAGEMENT

The range management program was designed to meet RPA goals of producing and utilizing livestock range forage to help meet the Nation's demand for red meat, while maintaining and improving the productivity of the range ecosystems. The funded goals were to produce 11.9 million animal unit months (AUM's) of forage available for livestock grazing (11.7 million were actually produced), while permitting 10.0 million AUM's of grazing on National Forest System lands. Actual use was 8.8 million AUM's (table 1 and appendix tables C 20 and C 21). Wild horses and burros accounted for only 0.4 percent of the forage grazed on National Forest System land in fiscal year 1979. The range program in fiscal year 1979 was $31.9 million (figure 11).

In fiscal year 1979, improved management was started or maintained on 60 percent of the 10,967 range allotments on National Forest System lands (appendix table C 22). The goal of improving management is to increase forage supplies for both domestic and wild grazing and browsing animals and maintain and improve the productivity of the range ecosystem. Practices to improve forage production were started or completed upon 281,300 acres of range at a cost of $983,200. These practices also helped correct unsatisfactory range conditions on National Forest System ranges as well as improve forage supplies.

Cooperative Forestry provided 500 assists to private landowners that resulted in the improvement of about 44,200 acres of forested range on private land. These efforts were designed to encourage State and private landowners to increase forage available for grazing.

Two range evaluation projects in the Intermountain and Southern Areas were established to augment the Oregon Range Validation area. The Intermountain project involves two areas in the Southern project, five. Inventory of basic resources is nearly completed in the Intermountain and just starting in the South. Construction of improvements is just beginning in both projects.

In cooperation with the Bureau of Land Management, three experimental stewardship areas have been selected and two more are being considered.

RANGELAND MANAGEMENT

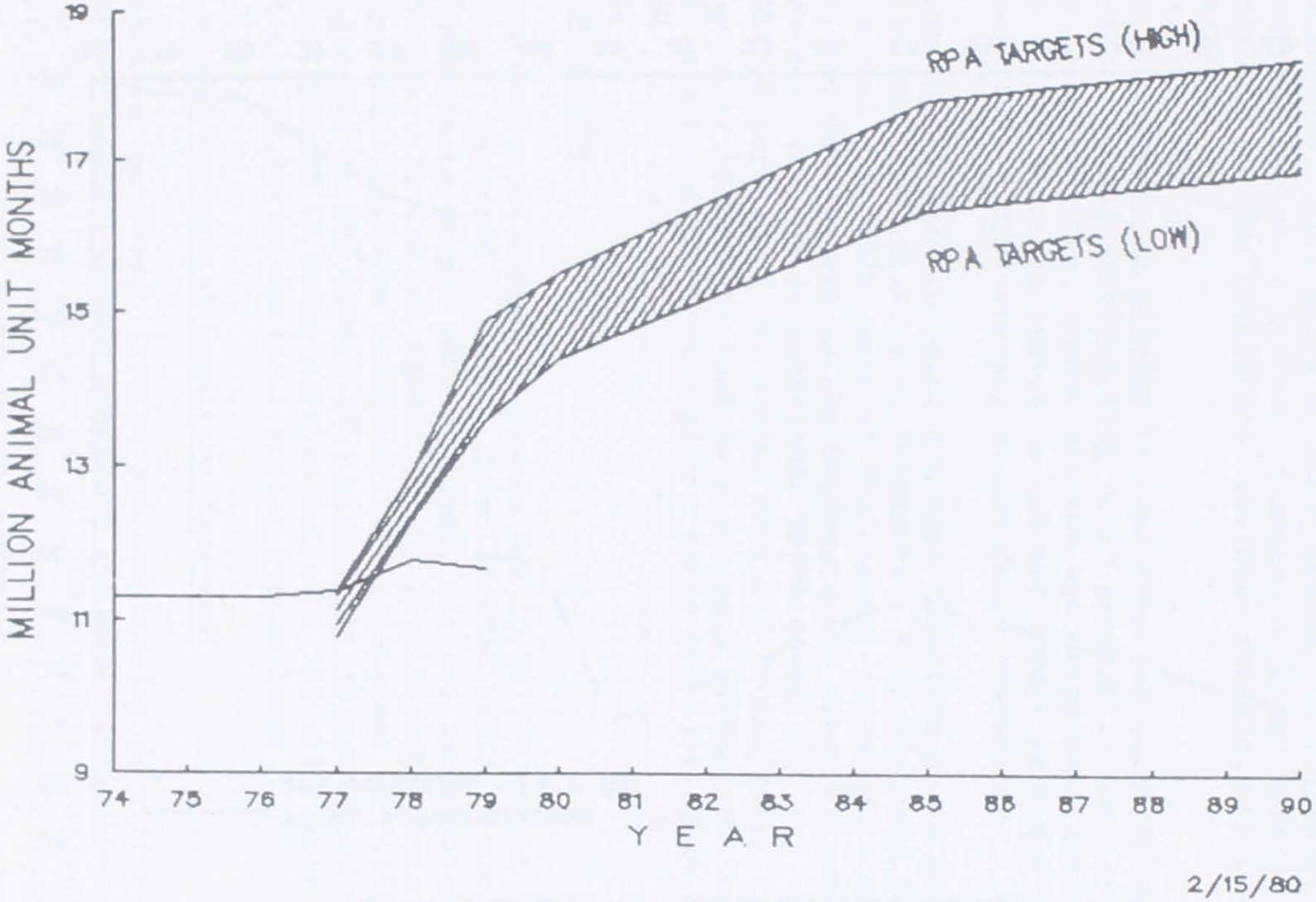


Figure 10.--Range program accomplishments in terms of animal unit months as compared to the RPA projected targets.

RANGELAND MANAGEMENT

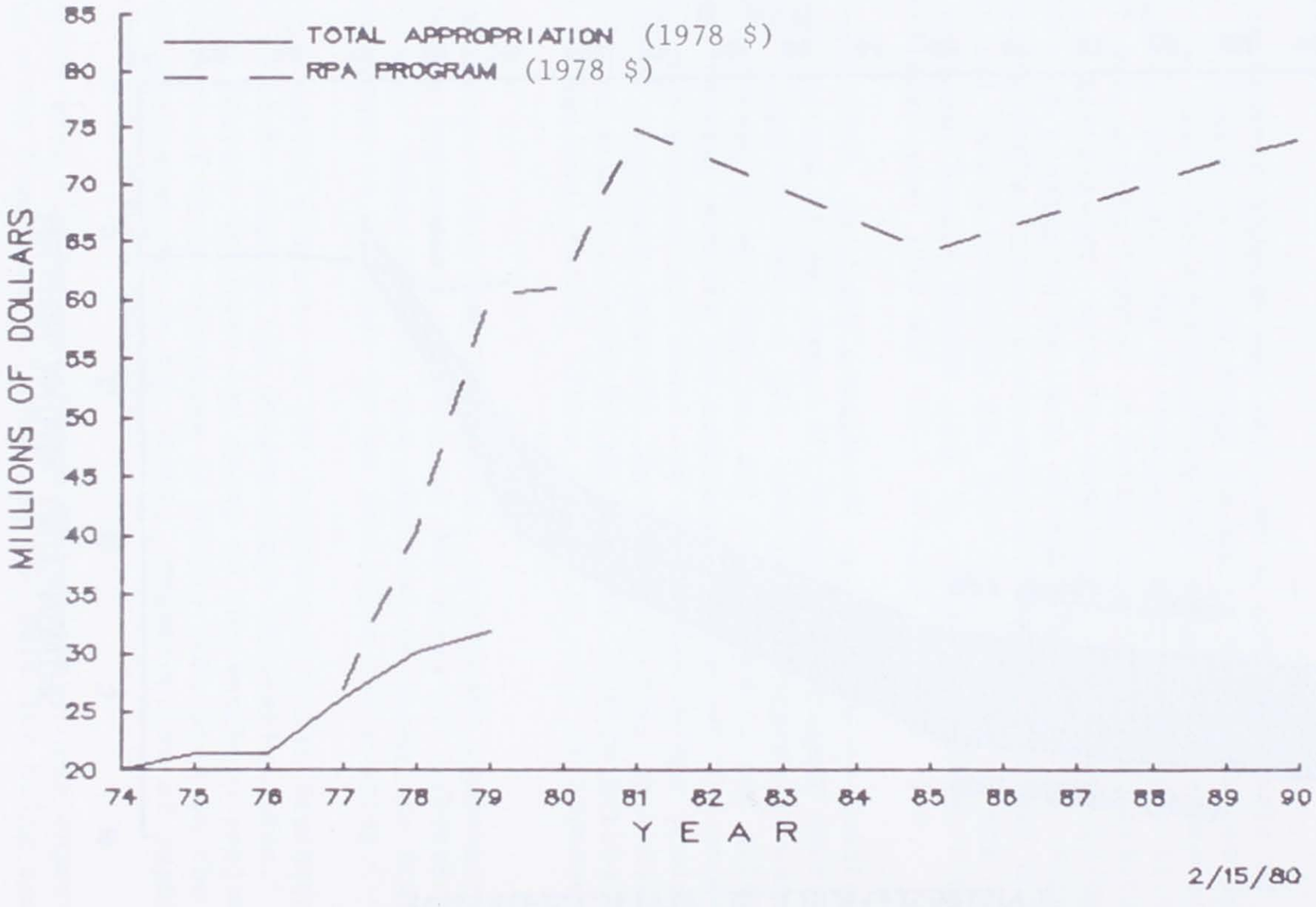


Figure 11.--Comparison of rangeland management annual funding with the RPA program.

The first stewardship steering committee will be fully established in early 1980.

Grazing Program

National Forest System ranges produced 11.7 million AUM's of forage in fiscal year 1979 that could have been used for grazing by livestock. This production is within 2 percent of the funded goal of 11.9 million AUM's and 80 to 85 percent of original RPA target goals of 13.8 to 14.6 million AUM's. The original RPA goals were based upon assumptions of full funding of the range management program.

Although the permitted grazing, was 9.8 million AUM's, only 8.8 were actually grazed. The remaining one million AUM's were not used for a variety of reasons. Late entry or early removal of livestock from the range because of inclement weather, inadequate forage because of poor growing seasons, and the permittees' personal reasons were the most common reasons.

Even though the permitted grazing is less than the total forage production, overstocking and understocking still persist in some areas. Whenever it is cost effective, strong efforts are being made under the RPA program to adjust stocking levels to use the forage resource while maintaining or improving productivity of the range resources.

Capital investments made to reach RPA cost-effective goals in livestock grazing also consider relative environmental, economic, and social benefits. In fiscal year 1979, most of the capital investments were made on the National Forests and in the Regions where range betterment funds were generated. The Public Rangelands Improvement Act (P.L. 95-514) directs that 50 percent of the monies received from grazing be established as a range betterment fund in a separate account in the Treasury and be made available for on-the-ground range rehabilitation and protection.

Improved Management

In 1979, the number of range allotments was 10,967, a slight increase from the 10,957 reported in 1978. This increase reflects establishment of new allotments to permit more efficient use and administration of range resources. It did not result in any significant change in acreage being grazed. Improved management was maintained on 5,698 allotments and started on 897 more. This means that improved and more intensive management is being carried out on 6,595 allotments or 60 percent of the 10,967 on National Forest System lands.

Treatment of Low Ecological Condition Rangeland

Actions taken by the Forest Service and cooperating permittees to improve National Forest System ranges in low ecological condition resulted in the initial treatment of 281,300 acres as compared to the fiscal year 1979 goal of 164,900 acres. Actions taken included land

treatments, installation of improved grazing systems, and adjustments in numbers of permitted livestock. These treatments are all designed to improve ecological conditions and to increase productivity of the range, thus benefiting livestock grazing, wildlife, watershed condition, and recreational use.

Grazing Fees

In 1978, Congress passed the Public Rangeland Improvement Act (P.L. 95-514) which established the formula for determining grazing fees for the National Forests in the 16 Western States. This formula will be used to establish fees for the 1979 through 1985 grazing seasons. Under this formula, the 1979 grazing fees averaged $1.93 per unit month. A unit month is 1 month of grazing for a bull, cow, horse, or five sheep or goats. Grazing fees for the 17 National Grasslands in the nine Great Plains States averaged $2.81 and were determined by using the same formula, but with data oriented to the Grasslands. Grasslands in Idaho and Oregon averaged $1.99. The 1979 grazing fees averaged $0.25 per unit month in the Southeastern National Forests and ranged from $0.22 to $3.50 in the Northeast.

Range Evaluation and Testing

The RPA program calls for three major evaluation and testing projects to determine the validity of the assumptions made in selecting the program. The first project was established and funded in Oregon in 1976. This project is in full operation. In fiscal year 1979, additional projects were established in the Intermountain West and in the Southern United States. Each project involves two or more States and several agencies.

In Oregon, significant progress has been made. Through fiscal year 1979, 18 coordinated resource plans have been completed, 180 miles of fence constructed, 254 small water developments made, 4,093 acres seeded, and improved management installed on 602,000 acres of private and Federal ranges.

The Intermountain project includes two areas, one in Nevada and one in Utah. Inventories of basic resources are almost finished. Although the coordination plans are not yet complete, some land treatment, fencing, and water development were carried out under pre-existing allotment plans. Excellent cooperation has been extended to this project by the Federal and State agencies and universities involved.

In the South, five areas, all on National Forest lands in Texas, Louisiana, Mississippi, and Florida, have been selected. Some 30 cooperative agreements with various universities and private agencies have been completed. Inventories of basic soil, vegetation, and wildlife resources were started and some watershed improvements made in the Texas area. Further progress was limited because of inadequate funds.

Experimental Stewardship Program

The Public Rangelands Improvement Act (P.L. 95-514) provides for the development of a range stewardship program. The purpose of the program is to provide incentives or rewards to holders of grazing permits and leases whose stewardship results in the improvement of range conditions on the lands under permit or lease. Cooperatively, the Forest Service and the Bureau of Land Management have developed guidelines to select areas and to establish stewardship steering committees. Three experimental stewardship areas have been selected--Challis in Idaho, East Pioneer in Montana, and Modoc-Washoe in California. Two other areas in Utah and New Mexico are also being considered for the program. Establishment of the Challis Steering Committee was started and should be completed by early 1980. The goal is to have four or five stewardship areas to represent a broad spectrum of range types and conditions by mid-1980.

WILDLIFE AND FISHERIES MANAGEMENT

Increased populations of wildlife and fish are needed to meet the increasing demand for sport and commercial fishing, hunting, and appreciative (e.g. viewing, photography, study) use. The RPA goal for wildlife and fish is to provide for greater species diversity, protection of endangered and threatened species, and increased wildlife and fish populations through a substantial increase in habitat management.

Wildlife and fish habitat improvement in fiscal year 1979, as compared to the RPA targets and fiscal year funded targets, is presented below:

	Program targets and accomplishments			Fiscal year 1979	
		RPA estimates			
Item	Unit of measure	High	Low	Funded targets	Accomplishments
Wildlife habitat improvement	M acres	852	793	778	950
Fish habitat improvement	M acres	18	17	17	24

Conclusions indicated must be qualified because units of measure of habitat improved have changed since the 1975 RPA program was prepared. The change is more pronounced for wildlife habitat; fish habitat is about the same. Thus, conversion to the original units for wildlife in 1979 are approximations based on generalized conversion factors. Also, the fiscal year 1979 accomplishment figures overstate improvements because some improvements accomplished by other funds are included. Accomplishment by appropriated wildlife and fisheries funds alone would approximate the funded targets.

Because of the change in units of measure, a better yardstick for comparing fiscal year 1979 with RPA is funding. Fiscal year 1979 appropriations were 62 percent of those required to meet RPA. The 1979 RPA amount of $46,396,000 for wildlife and fish is the midpoint of the range.

Hunting and sport fishing in 1979 totaled 32,104,000 recreation visitor-days (appendix tables C 2 and C 3). Appreciative wildlife use is included in the nature study category of the recreation tables and cannot be separated from other items in this category (appendix tables C 2 and C 3).

SOIL AND WATER MANAGEMENT

The Soil and Water Management Program is discussed in terms of three major activity areas. They are management, resource improvement, and resource inventory. Each has broadly defined long-range goals and objectives, the achievement of which required continuous year-to-year funding and effort. Additionally, these activities may have some specifically funded goals or targets that are expected to be accomplished during the funding period. The major activities are as follows:

Management

This category includes the technical soil and water input to the development of land management plans and the development of other resource management plans for timber, recreation, range, and fish and wildlife management. Technical information and assistance is provided also for water resource development planning done by other agencies.

Water quality monitoring measures the effects of land management programs on water quality and quantity and whether or not project and land management goals for the water resource are being met. The monitoring program indicates that the fiscal year 1979 water resource goals of achieving water quality and quantity necessary to meet public needs were achieved.

Water rights management includes the securing and maintenance of needed water rights under appropriate State and Federal laws to protect the interests of the United States. Recent Supreme Court decisions have affected the validity of certain U.S. reserved water rights, requiring much attention to the acquisition of sufficient water under State law to maintain water supply needed for National Forest management purposes.

The above activities account for approximately 50 percent of the soil and water budget. They were carried out at the level required to maintain water quality and soil productivity.

The maintenance of soil and water resource improvements to protect existing capital investment is a continuing goal. Necessary condition surveys and repairs were accomplished during fiscal year 1979.

Soil and Water Resource Improvements

These are activities carried out to improve soil and water quality and productivity and to reduce the acreage of soil and water restoration improvements identified in the 1975 RPA. This needed improvement consists of 315,000 acres of land that are continuing to decline in watershed condition and are contributing to diminished water quality and soil productivity. The attainment target was 35,092 acres and 35,726 acres were actually treated. In addition, $540,000 was programed for the preliminary resource improvement phase of stabilizing 4,000 acres of badly eroded land within the Dump Creek drainage in Idaho. This work involved the planning and construction of a major stream control facility for the diversion of Dump Creek to its original channel. This was successfully accomplished in fiscal year 1979. Additional work in actual land stabilization may occur in future years.

Burned area rehabilitation is part of the total soil and water management job. Rehabilitation following wildfire requires preparation of burned area survey reports and supervision of the installation of rehabilitation measures. These measures include improvement of drainage on roads and trails, stream channel clearing to facilitate the rapid movement of large volumes of water, and the aerial seeding of selected areas within the burns to provide ground cover quickly for control of soil erosion.

During fiscal year 1979, there were 14 burned areas requiring rehabilitation to protect the soil and water resources. Approximately $500,000 of emergency burn area rehabilitation funds were expended for this purpose.

Soil and Water Resource Inventories

Soil resource inventory provides information about the use and production capabilities of soils. The soils are identified, classified, mapped, and evaluated by these inventories. Land form, geology, vegetation, and climate associated with specific soils are used in determining important soil and land limitations for land use and project planning. Accomplishment is measured in units called acre equivalents, which reflect, in relative terms, the combination of varying intensities of inventories rather than a direct measure of acres inventoried. There were 12,252,000 acre equivalents planned in 1979 and 15,530,000 acre equivalents actually accomplished. Accomplishments exceeded targets because of the need to accelerate land and resource management planning.

Water resource inventories are the classifying and mapping of watersheds and watershed areas, grouping areas of similar characteristics, and predicting water quality and quantity response to use and management. Inventories are done at varying intensities, depending on management objectives and needs. More detailed inventories are usually needed for project planning, whereas less detailed inventories are generally suitable for broader land management planning. During 1979,

16,632,000 acres were planned to be covered by water resource inventories. Actual accomplishments were 18,056,000 acres. The overachievement was necessary to meet accelerated land and resource management planning in most Regions.

MINERALS MANAGEMENT

Prior to fiscal year 1978, minerals management accomplishment was reported only in terms of "acres under lease." This was judged as too narrow and remote from the main job of providing the review and resource integration needed so that minerals can be developed in environmentally sound and timely ways. As in the fiscal year 1978 report, accomplishments are reported also in terms of "operating plans developed or administered." Estimated production, which depends upon program accomplishment, is also reported.

In terms of acres under lease, the 1975 RPA program called for 1979 outputs lying between 30.7 and 33.2 million acres. Actual acreage under lease ws 30.9 million acres.

A total of 15,558 operating plans were completed or administered during fiscal year 1979. This compares with a target of 15,666 plans.

Energy minerals production in fiscal year 1979 is estimated at:

Oil--12 million barrels
Gas--23 trillion cubic feet
Coal--7 million tons

In fiscal year 1978, actual energy minerals production amounted to the following:

Oil--9.28 million barrels
Natural gas--20 trillion cubic feet
Coal--5.1 million tons

Table 8.--Minerals program accomplishments

Fiscal year	Acres under lease	Energy related operating plans	Non-energy related operating plans	Oil (barrels)	Gas (M cubic feet)	Coal	Geothermal
	Millions	Number	Number	Number	Thousands	Tons	
1977	17.5	7,120	5,520	8,114,314	18,427,094	4,230,541	None
1978	23.0	8,700	5,800	9,280,715	20,021,780	5,100,000	None
1979	30.9	8,500	3,157	12,000,000 1/	23,000,000 1/	7,000,000 1/	--

1/ Estimated.

Locatable and salable minerals were produced but were not reported.

Table 9.--Minerals area management

Regions	Budget allocation operating plans	Actual accomplishment operating plans 1/
1	3,239	2,839
2	1,915	2,158
3	2,022	945
4	2,190	2,418
5	786	742
6	2,973	1,838
8	897	2,586
9	1,503	1,933
10	105	90
Total	15,666	15,558

1/ Region 3 planned an accomplishment of 2,022 operating plans but completed 945 due to slowed oil and gas activities in the Grasslands. In addition, many uranium leases which were small in land area have been consolidated.

Region 6 planned 2,973 operating plans but completed 1,838 due to geothermal leases being held up pending completion of land use plans. Also lease were held up due to wilderness status and EOS development. This policy was changed October 11, 1979 (fiscal year 1980) and completion of operating plans is continuing

Region 8 planned 897 operating plans and completed 2,586 due to significantly increased leasing activity in the Eastern Overthrust Belt and to stepped up oil and gas activity in Mississippi and Louisiana.

Region 9 planned 1,503 operating plans but completed 9,933 due to stepped up oil and gas efforts in Ohio and Pennsylvania (mainly deep-drilling), including outstanding and reserved rights activities.

SERVICES IN SUPPORT OF MANAGEMENT

Aviation and Fire Management

1979 Fire Season. In 1979, approximately 445,000 acres of National Forest land were burned over by wildfire. This resulted in the third worst fire year since 1960, surpassed only by 1970 (516,000 acres) and 1977 (448,000). Slightly more than 50 percent of this acreage (225,000 acres) was in the northern Rocky Mountain area of Central Idaho through Western Montana. Extreme drought conditions resulted in fuel moisture from 25 to 50 percent below normal in this area. The result was a rapid spread of fire ignitions before suppression could be accomplished. Over 3,000 starts occurred with over 70 percent or 2,100 being caused by lightning.

Other geographic regions of the United States experienced average or slightly above average burned over acreage. Following is a national comparison by year:

	'79	'78	'77	'76	'75	'74
Acres burned	445,000	106,000	448,000	143,000	177,000	209
Number of large fires (100+ acres)	176	143	161	132	100	179

Fire Management Acres Established. Fire management area plans were approved for 1,885,653 acres (Table 10 shows the distribution of the 1979 approved areas.) This added to the 4,804,231 acres established in 1978 results in 6,689,884 acres in established fire management areas (FMA).

Table 10.--Fire management areas implemented in fiscal year 1979

Region	Forest	Number of Areas	Total Acres
1	Kootenai	1	49,688
	Clearwater	1	265,779
	Deerlodge ---	1/	
	Beaverhead -------	1	110,566
	Bitterroot ---	1/	
3	Gila	2	53,120
	Coconino	3	319,100
	Apache-Sitgreaves	1	193,000
4	Challis	1	170,000
	Humboldt	2	481,400
	Payette	1	93,000
	Targhee	1	150,000
	Total		1,885,653

1/ Addition to previously established FMA.

Fires in Fire Management Areas. Approximately 150 fires occurred in approved fire management areas during the year. Suppression action was taken on these fires. This suppression action varied from confinement on 35 percent of the wildfires to putting out the remaining 65 percent. The action taken was dependent upon being able to meet predetermined land management objectives through the use of fire.

Fuels Management. Fuel reduction was accomplished on 375,214 acres in fiscal year 1979, exceeding the target of 360,000 acres. Approximately 9.6 percent of the total fuel treatment accomplishment was done by human resource program assistance. This percentage is up from the 3 percent human resource program involvement of 1978.

Aviation. Forest Service helicopter and fixed-wing operations totaled slightly more than 100,000 hours flown. Sixteen major accidents that resulted in fatalities, injuries, or significant loss of property occurred. Thirteen fatalities occurred, ten on a Forest Service DC-3 aircraft on a non-fire-related mission, one contract retardant plane pilot in California, and a contract retardant pilot and copilot in Montana.

	'79	'78	'77	'76	'75	'74
Injuries	21	0	6	10	7	24
Fatalities	13	0	2	2	6	16

Fire Prevention. Continued high emphasis was given to prevention in fiscal year 1978. The reduction in person-caused fires to 5,053 was significantly below the high RPA level of 5,856 (figures 12 and 13).

FIRE PRE-SUPPRESSION

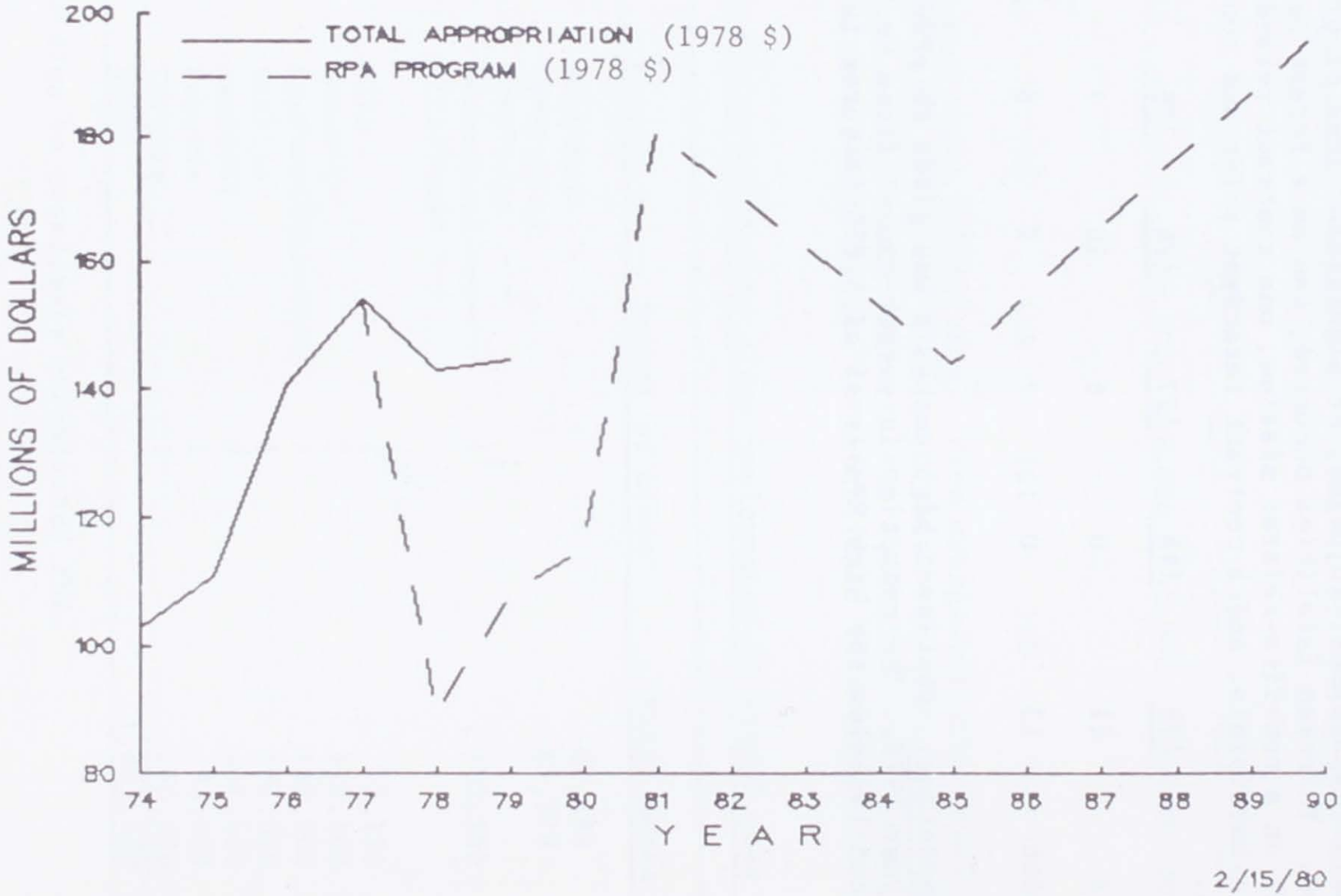


Figure 12.--Comparison of annual fire presuppression funding with the RPA program.

FIRE PRE-SUPPRESSION

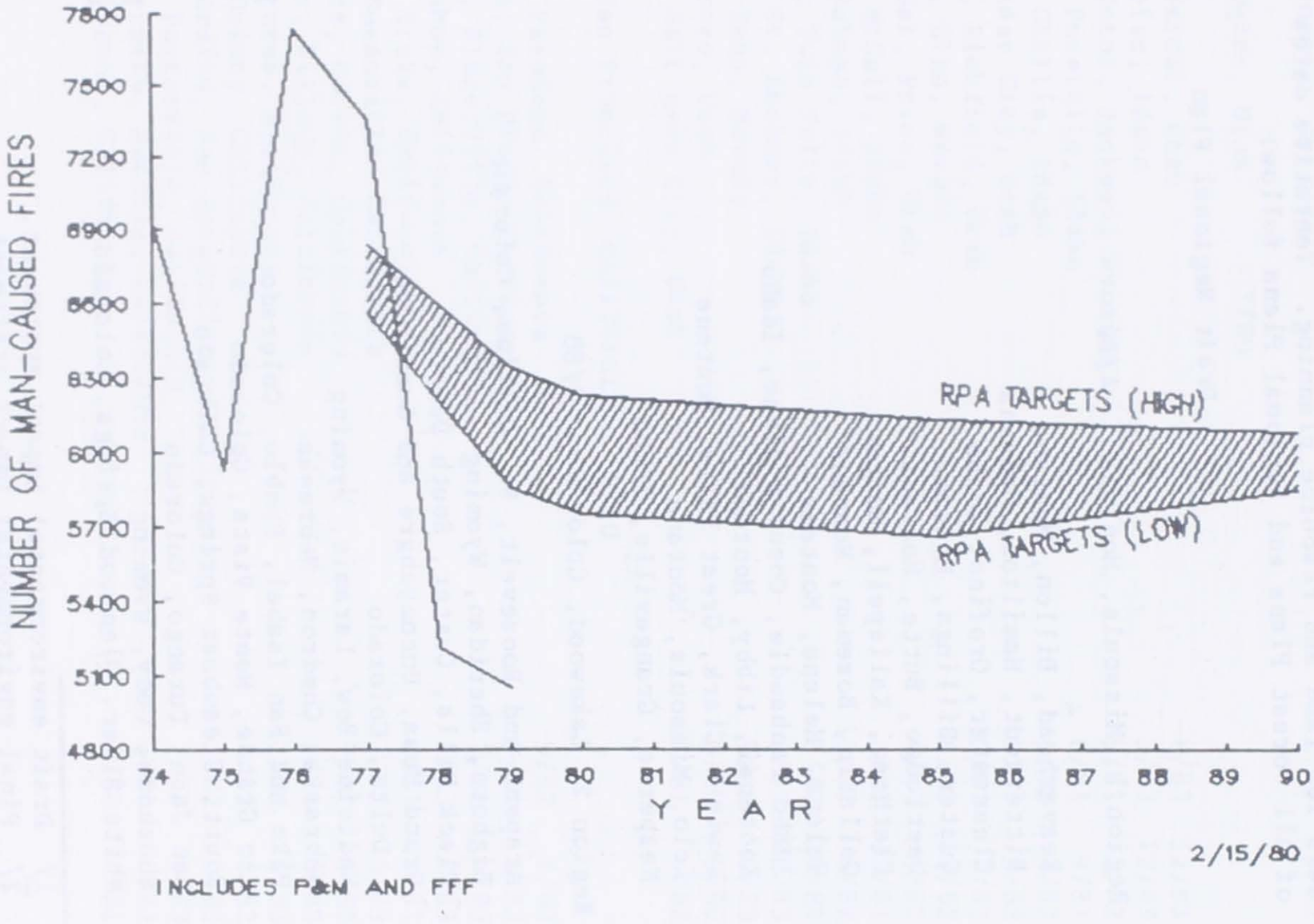


Figure 13.--Comparison of the annual number of man-caused fires with the RPA projected targets.

Land Management Planning

The final National Forest Management Act regulations were published in the September 17, 1979, Federal Register and adopted by the Secretary on November 5, 1979. These regulations will guide land and resource management planning on the National Forest System. The regulations require an integration of planning for all resources, (i.e., recreation, fish and wildlife, water, timber, range, and wilderness).

To assist all Forest supervisors and planning teams in the implementation of the regulations and development of forest plans, the Forest Service is conducting a National Land Management Training Program. The program consists of 16 sessions, which will conclude in May 1980.

In addition, the Forest Service is preparing various handbooks and manuals for land and resource planning. Tentative dates for completion of all Forest Plans and Regional Plans follow:

	Draft Regional Plan	Forest Plan	
		DEIS 1/	FEIS 2/
Region 1, Missoula, Montana	4/80		
Beaverhead, Dillon, Montana		5/81	12/81
Bitterroot, Hamilton, Montana		5/82	12/82
Clearwater, Orofino, Idaho		6/81	12/81
Custer, Billings, Montana		5/82	12/82
Deerlodge, Butte, Montana		5/82	12/82
Flathead, Kalispell, Montana		3/81	12/81
Gallatin, Bozeman, Montana		7/81	7/82
Helena, Helena, Montana		5/82	12/82
Idaho Panhandle, Coeur d'Alene, Idaho		8/81	1/82
Kootenai, Libby, Montana		5/81	9/81
Lewis & Clark, Great Falls, Montana		4/81	10/81
Lolo, Missoula, Montana		3/80	12/80
Nezperce, Grangeville, Idaho		10/80	5/81
Region 2, Lakewood, Colorado	9/80		
Arapaho and Roosevelt, Ft. Collins, Colorado		5/80	12/80
Bighorn, Sheridan, Wyoming		6/81	12/81
Black Hills, Custer, South Dakota		12/80	9/81
Grand Mesa, Uncompahgre and Gunnison, Delta, Colorado		6/81	12/81
Medicine Bow, Laramie, Wyoming		6/81	12/81
Nebraska, Chadron, Nebraska		9/80	6/81
Pike and San Isabel, Pueblo, Colorado		12/80	9/81
Rio Grande, Monte Vista, Colorado		9/82	3/83
Routt, Steamboat Springs, Colorado		6/81	3/82
San Juan, Durango, Colorado		9/80	9/81
Shoshone, Cody, Wyoming		12/81	6/82
White River, Glenwood Springs, Colorado		12/81	6/82

1/ Draft environmental impact statement.
2/ Final environmental impact statement.

	Draft Regional Plan	Forest Plan 1/ 2/
	DEIS	FEIS
Region 3, Albuquerque, New Mexico 12/80		
Apache-Sitgreaves, Springerville, Arizona	3/82	9/82
Carson, Taos, New Mexico	12/81	6/82
Cibola, Albuquerque, New Mexico	9/81	3/82
Coconino, Flagstaff, Arizona	3/82	9/82
Coronado, Tucson, Arizona	12/79	6/80
Gila, Silver City, New Mexico	3/81	9/82
Kaibab, Williams, Arizona	3/81	9/82
Lincoln, Alamogordo, New Mexico	12/81	6/82
Prescott, Prescott, Arizona	3/81	9/82
Santa Fe, Santa Fe, New Mexico	2/80	8/80
Tonto, Phoenix, Arizona	3/81	9/82
Region 4, Ogden, Utah 7/80		
Ashley, Vernal, Utah	6/83	12/83
Boise, Boise, Idaho	3/83	12/83
Bridger-Teton, Jackson, Wyoming	9/81	3/82
Caribou, Pocatello, Idaho	6/81	9/81
Challis, Challis, Idaho	6/82	3/83
Dixie, Cedar City, Utah	12/81	9/82
Fishlake, Richfield, Utah	12/81	3/82
Humboldt, Elko, Nevada	6/82	12/82
Manti-LaSal, Price, Utah	9/81	3/82
Payette, McCall, Idaho	3/81	12/81
Salmon, Salmon, Idaho	12/81	6/82
Sawtooth, Twin Falls, Idaho	6/82	12/82
Targhee, St. Anthony, Idaho	6/82	12/83
Toiyabe, Reno, Nevada	9/82	6/83
Uinta, Provo, Utah	3/80	9/80
Wasatch, Salt Lake City, Utah	12/81	6/82
Region 5, San Francisco, California 9/80		
Angeles, Pasadena, California	9/82	6/83
Cleveland, San Diego, California	9/82	6/83
Eldorado, Placerville, California	7/82	4/83
Inyo, Bishop, California	1/83	7/83
Klamath, Yreka, California	3/81	10/81
Lassen, Susanville, California	12/82	6/83
Los Padres, Goleta, California	9/82	6/83
Mendocino, Willows, California	9/82	5/83
Modoc Alturas, California	12/82	6/83
Plumas, Quincy, California	12/82	6/83
San Bernardino, San Bernardino, California	11/82	6/83
Sequoia, Porterville, California	1/83	7/83
Shasta-Trinity, Redding, California	3/81	10/81
Sierra, Fresno, California	8/80	4/81

	Draft Regional Plan	Forest Plan
		1/ 2/
	DEIS	FEIS
Six Rivers, California	3/81	10/81
Stanislaus, Sonora, California	7/82	4/83
Tahoe, Nevada City, California	7/82	4/83
Region 6, Portland, Oregon 7/80		
Colville, Colville, Washington	5/83	5/84
Deschutes, Bend, Oregon	3/80	9/80
Fremont, Lakeview, Oregon	6/83	12/83
Gifford Pinchot, Vancouver, Washington	6/82	12/82
Malheur, John Day, Oregon	12/81	6/82
Mt. Baker-Snoqualmie Seattle, Washington	4/82	12/82
Mt. Hood, Portland, Oregon	11/80	7/81
Ochoco, Prineville, Oregon	12/83	6/84
Okanogan, Okanogan, Washington	12/82	6/83
Olympic, Olympia, Wash.	12/81	9/82
Rogue River, Medford, Oregon	8/82	2/83
Siskiyou, Grants Pass, Oregon	3/81	9/81
Siuslaw, Corvallis, Oregon	12/82	12/83
Umatilla, Pendleton, Oregon	6/83	12/83
Umpqua, Roseburg, Oregon	5/82	4/83
Wallowa-Whitman, Baker, Oregon	12/81	6/82
Wenatchee, Wenatchee, Wash.	4/82	12/82
Willamette, Eugene, Oregon	12/83	9/84
Winema, Klamath Falls, Oregon	12/82	6/83
Region 8, Atlanta, Georgia 12/80		
Alabama, Montgomery, Alabama	82	83
Caribbean, Rio Piedras, Puerto Rico and the Virgin Islands	81	82
Chattahoochee-Oconee, Gainesville, Georgia	81	82
Cherokee, Cleveland, Tennessee	81	82
Daniel Boone, Winchester, Kentucky	82	83
Florida, Tallahassee, Florida	82	82
Francis Marion and Sumter, Columbia, South Carolina	82/81	83/82
George Washington, Harrisburg, Virginia	82	82
Jefferson, Roanoke, Virginia	82	82
Kisatchie, Pineville, Louisiana	82	83
Mississippi, Jackson, Mississippi	82	83
Nantahala/Pisgah, Asheville, North Carolina	80	81
Quachita, Hot Springs National Park, Arkansas	81	82
Ozark & St. Francis, Russellville, Arkansas	81	82
Texas, Lufkin, Texas	81	81
Uwharrie/Croatan, Asheville, North Carolina	81	82

	Draft Regional Plan	Forest Plan 1/ DEIS	Forest Plan 2/ FEIS
Region 9, Milwaukee, Wisconsin	12/80		
Allegheny, Warren, Pennsylvania		2/81	9/82
Chequamegon, Park Falls, Wisconsin		3/82	8/82
Chippewa, Cass Lake, Minnesota		7/82	12/82
Green Mountain, Rutland, Vermont		3/81	12/81
Hiawatha, Escanaba, Michigan		12/82	7/83
Huron-Manistee, Cadillac, Michigan		10/82	8/83
Mark Twain, Rolla, Missouri		12/81	9/82
Monongahela, Elkins, West Virginia		11/81	8/82
Nicolet, Rhinelander, Wisconsin		12/82	8/83
Ottawa, Ironwood, Michigan		2/83	12/83
Shawnee, Harrisburg, Ilinois		7/81	4/82
Superior, Duluth, Minnesota		8/80	2/81
Wayne-Hoosier, Bedford, Indiana and Ohio		9/82-3/81	8/83-9/81
White Mountain, Laconia, New Hampshire and Maine		4/81	1/82
Region 10, Juneau, Alaska	5/80		
Chugach		6/80	12/80
Tongass	FEIS was filed 3/79		

Lands

Landline Location. The 272,000 miles of property boundary contained in the National Forest System border approximately 3 million individual landowners. Most of the property lines have never been clearly identified on the ground. As a consequence, and estimated 50,000 occupancy trespasses exist and the potential for new occurrences is becoming greater as subdivisions proliferate adjacent to the National Forests. Also, losses in receipts from the sale of forest products have been identified as significant in an internal audit because of management to a "safe" setback line rather than to the true property line.

The RPA program for landline location calls for completing property boundary marking and posting by the year 2020. To date only 30,000 miles are adequately identified.

The programed target was exceeded for the first time in fiscal year 1979. The target of 5,800 miles was exceeded by 190 miles, and through utilization of the human resources program, an additional 673 miles were accomplished (table 11).

Table 11.--Miles of landline located by Region--fiscal year 1979

Region	Total Boundary	1979 Target	1979 Accomplishment	Done to date
1	30,664	532	437.5	1,774
2	51,433	235	257	1,116
3	19,991	278	319.2	2,852
4	28,659	451	504.6	1,623
5	29,577	863	684.7	1,934
6	25,627	718	1,259.8	2,861
8	42,280	2,498	2,862	27,848
9	42,642	196	293	1,946
10	1,536	29	44.9	208
Totals	272,000	5,800	6,662.7	42,132

Accomplishments in landline location were particularly noteworthy in Regions 6, 8, and 9. The high accomplishment in Region 6 was due to a significant increase in contracting for survey work. Regions 8 and 9 were able to utilize the Human Resource Program to increase their accomplishments substantially. Increases were also the result of a contining effort during the last few years to build up the cadastral talent needed for an increased program.

A large part of landline location is needed to support the timber sale program. However, it is also needed to increase the visibility of landlines to avoid trespass. It is, in addition, needed to develop survey information for use in litigation to resolve trespass suits by or against the Forest Service.

Land Acquired and Exchanged. The accomplishment reported is in acres of non-Federal land acquired. A total of 40,700 acres of National Forest System land was conveyed out of Federal ownership by exchange. A total of 68,400 acres was acquired through exchanges. Cash equalization payments made under the authority of the Federal Land Policy and Management Act of October 21, 1976, totaled $148,925 by non-Federal owners and $146,126 by the United States. The total cash equalization was 0.4 percent of the total appraised value of the lands involved.

The National Forest lands disposed of through exchange are primarily isolated tracts that are better suited for private ownership. Their removal from the National Forest System will result in a substantial savings in National Forest administrative cost by reducing the miles of National Forest property lines and property corners to be maintained.

The lands acquired are desirable for National Forest purposes such as timber production, watershed protection, outdoor recreation, range, wildlife habitat, and wilderness. The acreage gain will increase the environmental quality while increasing public assess to National Forest lands.

Several land exchanges have been delayed to complete environmental assessments or statements. However, these cases will be completed in fiscal year 1980.

Land and water conservation fund (L&WCF) monies totaling $56,764,574 were used to acquire 64,745.49 acres of land. These lands include needed properties in several congressionally designated areas (such as national recreation areas, wild and scenic rivers, wildernesses), as well as high priority composite and inholding purchases in other units of the National Forest System. These lands will meet identified public outdoor recreation needs, protect critical resources, and enhance the management effectiveness of numerous National Forest System units.

There were also 11,215.94 acres acquired with $2,951,765 of Weeks and related acts appropriations. These lands were high priority tracts needed for effective management of the National Forest System. The public benefits include improved watershed protection, improved wildlife habitat management, increased dispersed recreation opportunities, timber production, and reduced administrative costs for all levels of Government.

The accomplishment reported for donations is in acres acquired. Although there was no funded target for land donation, 1,743.58 acres of land were acquired by acceptance of title to lands from 14 landowners (table 12).

Table 12.--Land acquisition and exchange

	Acres	Cases	Value
	(Number)	(Number)	(Number)
Purchases 1/	75,703.9	474	59,168,236
Exchange 2/	68,431.7	96	36,675,124
Donation 1/	1,743.6	14	392,422
Special studies 3/	170,000	12	50,000,000

1/ Acres acquired.
2/ Acres offered-approved.
3/ Made for land transfers, interchanges, boundary modifications.

Roads

The protection, development, and management of the National Forest System lands and resources have resulted in a variety of goods and services available to the American people.

Transportation is one of the key elements in the delivery of these resources. The well-planned development of a road or road network responds to several demands and eventually results in benefits to all resources. The intent of the annual program of work is to provide management with new or improved access to the resources enabling management to carry out long-range plans. At the same time, immediate benefits are provided to management for such activities as fire and insect and disease protection, and to forest users for recreation, hunting and livestock grazing.

Construction of the roads can be accomplished by one or more different investment methods. Among them are public works contracts with appropriated funds to meet future needs; timber purchaser construction with offsetting credits against the value of timber sold to meet current harvest schedules; and cooperation with other public and private landowners to meet shared current and long-term requirements. (Figure 14 shows the comparison of the appropriated road and trail funds with the RPA Program).

The result is an annual road program estimate of the combination of these methods that will best serve all resource programs. Adjustments are made throughout the year as actual contracts are made and options selected for resource production.

How well the road program responds can only be measured in the resource outputs achieved over time. Thus real outputs of goods and services (production curves) lag inputs of constructed facilities (investment curves) by 3-5 years.

Accomplishments are a reflection of the final program carried out, adjustments are made based on funds available, and costs are based on competitive bids. Road construction is reported as accomplished in the fiscal year in which the contract is signed.

The accomplishment of 820 miles of appropriated road construction was more than the targeted figure of 626 miles; 111 bridges were also constructed (table 13 and figure 15). The increase of 194 miles includes 56 miles reconstructed due to storm damage. Part of the increase is shift of miles from timber purchaser to public works contract. Some roads planned as part of timber sales which did not sell, were constructed as preroading projects by public works contract; timber and other resources will benefit in years beyond fiscal year 1979.

Appropriated road construction exceeded funded targets because receipts in fiscal year 1979 exceeded estimated receipts, and this increased the 10 percent road construction fund by approximately $22 million. Estimates provided in the budget process 18 to 24 months in advance are not firm. Also, competitive bidding (and the variables associated with it) resulted in individual project saving.

FOREST ROADS AND TRAILS CONSTRUCTION

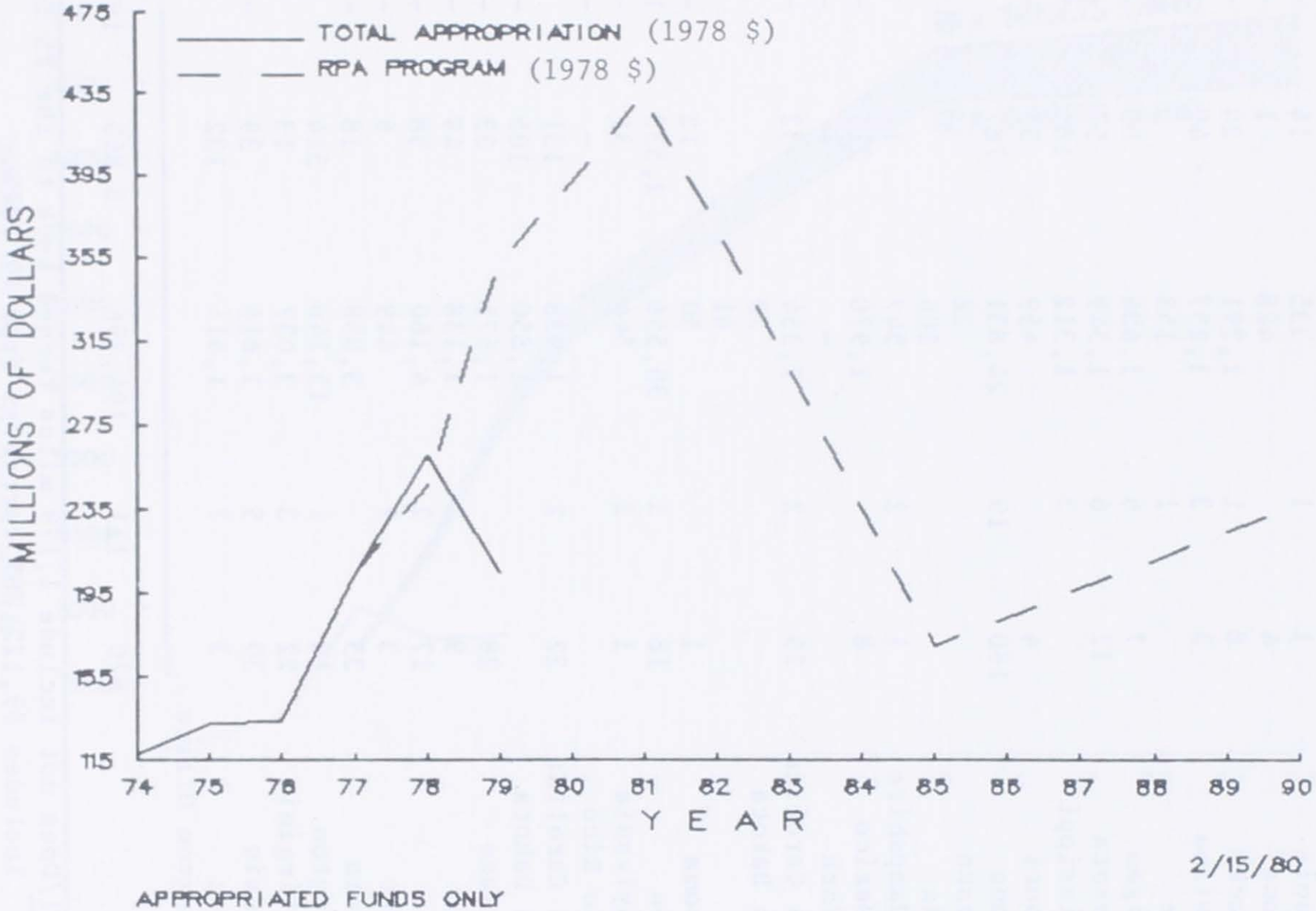


Figure 14.--Comparison of annual roads and trails construction funds with the RPA program.

Table 13.--Road and bridge construction and reconstruction

State or commonwealth	From appropriated funds			By timber purchasers		
	Road	Bridges	Dollars	Road	Bridges	Dollars
	Miles	Number	Thousand	Miles1/	Number	Thousand
Alabama	2	4	961	20	-	186
Alaska	4	4	10,156	368	160	32,428
Arizona	70	-	4,838	378	-	3,346
Arkansas	3	5	3,070	181	-	4,262
California	52	5	35,515	1,671	8	29,160
Colorado	30	1	7,444	276	-	2,184
Florida	4	4	987	56	-	778
Georgia	17		1,636	35	-	667
Idaho	186	15	23,956	729	-	15,044
Illinois	1	1	335	14	-	60
Indiana	4		428	1	-	2
Kentucky	8	1	1,291	24	-	416
Louisiana	3	3	1,257	49	3	1,521
Maine		1	153	3	-	163
Michigan	7	6	1,604	60		246
Minnesota	12	6	1,549	57	-	410
Mississippi		3	1,312	185		1,933
Missouri	4		459	35	-	163
Montana	180	19	24,831	787	7	16,897
Nebraska			28			
Nevada			206			
New Hampshire	1	2	547	17		268
New Mexico	8		2,970	211	-	1,570
New York			-	-	-	-
North Carolina	25	2	2,354	52	-	822
North Dakota			20			
Ohio			61			
Oklahoma	1		50	12	-	264
Oregon	18	3	30,556	2,533	11	70,290
Pennsylvania	1	2	544	31	-	610
Puerto Rico				-	-	-
South Carolina	22	2	1,938	131		2,342
South Dakota			1,850	105	-	1,035
Tennessee	28		1,675	33	-	490
Texas	9	2	1,138	49	-	1,119
Utah	17	2	4,160	38	-	1,044
Vermont	3	2	449	6	-	62
Virginia	35		3,058	18	-	179
Washington	10	1	15,146	514	5	25,570
West Virginia	22	3	3,037	13	1	429
Wisconsin	30	5	1,616	39	-	260
Wyoming	3	7	1,611	132		1,595
Washington Office						
Total	820	111	194,796	8,863	195	217,815

1/Does not include 1,179 miles turned back to the FS for construction. Includes $9,122,765 carryover from FY 1978.

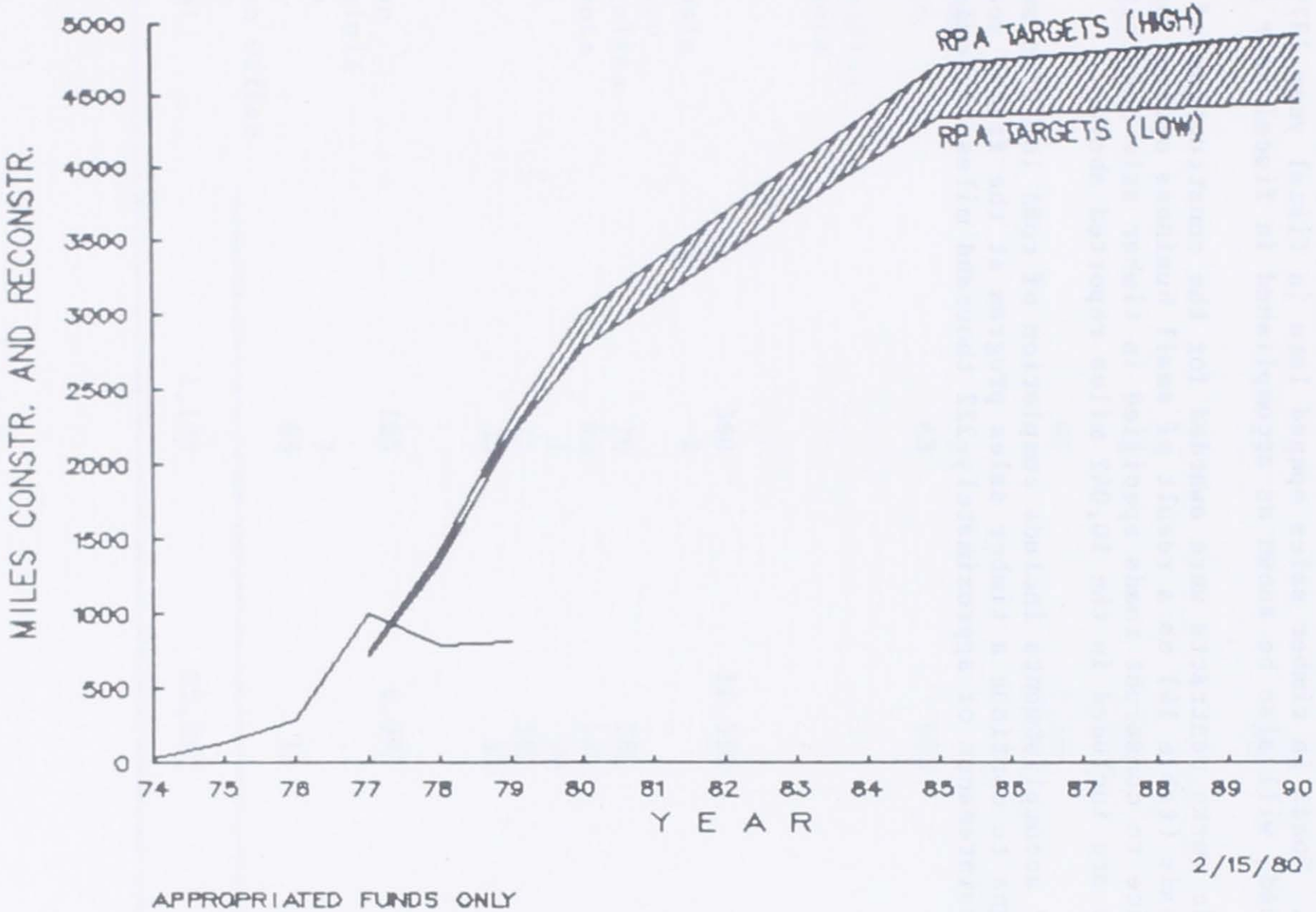


Figure 15.--Comparison of annual miles of road construction and reconstruction compared with the RPA projected targets.

Funding at the fiscal year 1979 level for the road construction program will be sufficient to support the RPA program. However, the method of funding identified in the RPA program--public works construction versus purchaser construction--will not be met. The approximate ratio in RPA is 30 percent public works construction to 70 percent purchaser construction in miles.

The target for purchaser constructed road construction of 12,317 miles was not met in fiscal year 1979. Actual accomplishment was 10,042 miles of road and 195 bridges (table 13). The difference of 2,275 miles can be attributed to the fact that many small business concerns elected late in the fourth quarter of the fiscal year to have the Forest Service construct roads. The road construction completion date in the sale will still be met. The public work contracts for this work will be signed in fiscal year 1980 and were not shown as accomplished in fiscal year 1979. Roads in timber sales opened late in fiscal year 1979 but not awarded, will also be shown as accomplished in fiscal year 1980.

Public works contracts were awarded for the construction of 1,179 miles of roads (table 14) as a result of small business opting for the Forest Service to construct roads specified in timber sale constrcts. (These miles are included in the 10,042 miles reported above).

Other accomplishments include completion of road location surveys and designs to continue a timber sales program at the fiscal year 1979 level, and maintenance of approximately 222 thousand miles of roads.

Table 14.--Timber purchaser roads constructed by the Forest Service

State or Commonwealth	Road (Miles)	Dollars (M)
Alabama	29	338
Alaska	-	-
Arizona	54	45
Arkansas		43
California	63	880
Colorado	21	94
Florida	16	260
Georgia		
Idaho	90	1,728
Illinois		
Indiana		
Kentucky	3	44
Louisiana	13	250
Maine		
Michigan		
Minnesota	3	
Mississippi	8	137
Missouri		
Montana	91	1,281
Nebraska		
Nevada		
New Hampshire	2	
New Mexico	63	940
New York		
North Carolina		
North Dakota		
Ohio		
Oklahoma		
Oregon	360	11,590
Pennsylvania	2	
Puerto Rico		
South Carolina	10	180
South Dakota	42	122
Tennessee	1	38
Texas	21	382
Utah	30	37
Vermont		
Virginia		
Washington	185	6,997
West Virginia		
Wisconsin	7	
Wyoming	65	12
Washington Office		
Total	1,179	25,398

Cooperative Law Enforcement Program

Law 92-82. The purpose of this legislation is to provide reimbursement to the States and local law enforcement jurisdictions for protecting the public and their property on the National Forests.

During 1979, 642 agreements were executed. A special study authorized by Congress to measure the effect of cooperative search and rescue agreements was also concluded in 1979.

SECTION D

HUMAN RESOURCE PROGRAMS

Introduction

The Human Resource Programs conducted by the U.S. Department of Agriculture, Forest Service, strive to achieve a blending of human and natural resources. These programs foster the Secretary's commitment and the Agency's mission to serve the unemployed, underemployed, minorities, economically disadvantaged, youth, and the elderly through forestry activities. Human resource programs provide employment, skills training, experience, and education for both young and old persons. The programs also contribute substantially to the improvement of facilities and the management of public forest and range lands.

During fiscal year 1979, $156.9 million was allocated to the Forest Service to provide employment for four major programs: Young Adult Conservation Corps, Youth Conservation Corps, Job Corps, and Senior Community Services Employment Program. The Forest Service-administered programs and those conducted by State and local agencies through Federal grants provided skills training and employment to 109,825 persons during the year (table 1). The amount of work accomplished by these programs equaled 16,617 person-years and was valued at $164.1 million.

Young Adult Conservation Corps Program

The Forest Service sponsors three youth employment programs. The Young Adult Conservation Corps (YACC) provides year-round jobs for unemployed and out-of-school young men and women between the ages of 16 and 23. The YACC is administered jointly by the Departments of Agriculture and the Interior, through an agreement with the Department of Labor. In addition, funds are made available to States to support YACC programs on State and local public lands. During fiscal year 1979, 28,310 young persons participated in Forest Service YACC conservation projects accomplishing 6,689 person-years of work; 37 percent of the enrollees were women and 26 percent were minorities (table 1 and appendix table D 1).

Table 1.--Summary of human resource programs--fiscal year 1979

Program	Funding ($ millions)	No. of persons served	Person-years accomplished	Value of work ($ millions)	Percent women	Percent minority	Percent placements	Dollar investment return
Young Adult Conservation Corps	$ 80.4	28,310	6,689	$ 89.8	37	26	--	$1.12
--State grant	--	31,500	--	--	--	--	--	--
Youth Conservation Corps	21	12,377	1,869 1/	23.9	48	19	--	$1.14
Job Corps	41	9,571	3,631	12.6	3	65	93	
Senior Community Service Employment Program	14.5	4,017	2,175	17.8	28	16	--	$1.32
Volunteers in the National Forests	Unfunded	12,294	569	4.7	41	17	--	--
Other hosted	Unfunded	11,756	1,684	15.3	23	37	--	--
Total	$156.9	109,825	16,617	$164.1	--	--	--	--
	State grant (31,500)							

1/ Converted from person-weeks data.

Youth Conservation Corps Program

The Youth Conservation Corps (YCC) provides summer employment for 15 through 18-year-old youths from all segments of our society. YCC participants not only receive jobs doing needed conservation work, but they also are given valuable instruction in environmental awareness. The Corps is jointly administered by the Departments of Agriculture and the Interior; the Departments also share responsibilities in administering grants provided to all States and territories. In fiscal year 1979, 12,377 young persons were enrolled in YCC camps administered by the Forest Service on Federal lands; 48 percent of the participants were women and 19 percent of the enrollees were minorities (table 1 and appendix table D 2). The enrollees accomplished 1,869 person-years (84,110 person-weeks) of conservation work/environmental education valued at $23.9 million. For each dollar invested in the YCC program, $1.14 worth of conservation work was accomplished.

Job Corps Program

The Job Corps program provides disadvantaged young people with both educational and vocational training. The Forest Service currently cooperates with the Department of Labor in administering 18 Job Corps Civilian Conservation Centers. During fiscal year 1979, approximately 9,571 youths, aged 16 to 21 years old, were enrolled at Forest Service Centers. Of this total, 65 percent of the corpsmembers were minorities and 3 percent were women (table 1 and appendix table D 3). The success of this program is exemplified by the fact that 93 percent of the Corpsmembers who completed their training at Job Corps facilities on National Forest lands during fiscal year 1979 were placed either in school, the armed forces, or on a job. While undergoing training, Job Corps enrollees accomplished 3,631 person-years of natural resources work valued at $12.6 million.

Senior Community Service Employment Program

In addition to these youth employment programs, the Forest Service also cooperates with the Department of Labor to sponsor an employment program for seniors. The Senior Community Service Employment Program provides supplemental income, work experience, and skills training to economically disadvantaged seniors aged 55 and older. Program participants are provided part-time employment opportunities involving construction, rehabilitation, maintenance, and natural resource improvement ment projects. During fiscal year 1979, 4,017 seniors were enrolled in the program; 28 percent of these enrollees were women and 16 percent were minorities (table 1 and appendix table D 4). These senior workers accomplished 2,175 person-years of conservation work valued at more than $17.8 million. For each dollar spent in the program, work accomplishment valued at $1.32 resulted.

Volunteers in the National Forests Programs

In addition to programs that provide compensation, the Forest Service conducts a volunteer program whereby groups or individuals may donate their time to preserve and conserve our natural resources. The Volunteers in the National Forests program allows unlimited opportunities for interested persons to contribute their talents and knowledge towards the enhancement of Forest Service activities. During fiscal year 1979, 12,294 persons participated in the volunteers program; approximately 41 percent of the volunteers were women and 17 percent were minorities (table 1 and appendix table D 5). Participants contributed 569 person-years of work valued at more the $4.7 million.

Other Hosted Programs

The Forest Service also serves as a host agency for cooperative programs administered by State and local governments. Other hosted human resource programs include College Work Study, Work Incentive Program, Vocational Work Study, and programs authorized under the Comprehensive Employment and Training Act. During fiscal year 1979, 11,756 persons participated in these cooperative programs; approximately 23 percent were women and 37 percent were minorities (table 1 and appendix table D 6). Program participants accomplished 1,684 person-years of conservation work valued at more than $15.3 million.

SECTION E

PESTICIDE USE ON NATIONAL FOREST SYSTEM LANDS

Pesticides, including insecticides, herbicides, fungicides, and rodenticides, are used by the Forest Service as a component of integrated pest management in the prevention and suppression of insect and disease outbreaks; reduction of unwanted vegetation on range, timber, and recreation lands; control of damaging vertebrate populations; and achievement of other management goals affected by various pests.

Before pesticides are prescribed on National Forest System (NFS) lands, environmental analyses are conducted to determine the best means of meeting specific resource management objectives. Whenever pesticides are determined essential, only those registered by the U.S. Environmental Protection Agency (EPA) are used. Implicit in the EPA registration is the avoidance of unreasonable adverse environmental or human health effects when the pesticides are used in accordance with label directions.

Pesticides are important tools for protecting and enhancing resource values on the approximately 187 million acres of Federal land administered by the Forest Service. An average 1/ of 440,746 acres of National Forest System lands are treated annually with pesticides. Of this, 169,501 acres are treated with approximately 394,648 pounds of herbicides, while 271,245 acres are treated with approximately 277,832 pounds of insecticides, acaricides, fungicides, rodenticides, and other pesticides. This represents pesticide applications on less than 1 percent of the total Forest Service land each year. Many acres do not develop conditions requiring treatment; others, once initial conditions are corrected, never need retreatment if properly managed, while still other areas may need treatment 2 to 3 times during the first 40 years of a forest rotation.

No significant adverse environmental effects are known to have occurred in fiscal year 1979 on National Forest System lands. Several spill incidents were reported; however, properly applied cleanup procedures prevented significant adverse effects. Claims of adverse human health effects because of Forest Service applications of pesticides were also reported but these remain unsubstantiated.

The beneficial effects of using pesticides on NFS lands are most evident in three general categories: Vegetation management, insect and disease prevention and suppression, and animal damage control.

1/ Averages in this report refer to pesticide-use patterns for fiscal years 1974 through 1978.

Vegetation Management

Vegetation management is the manipulation of the kinds, amounts, quality, and condition of the vegetation resource. Forest vegetation management programs range from complete protection of the vegetation resource to intensive management favoring a particular plant species. It is estimated that approximately 39 percent of commercial forest land in the United States is dominated by undesirable vegetation. Significant gains in forest productivity could accrue from increased vegetation management activities on these lands. These activities can be grouped into eight major categories: noxious weed control, range improvement and maintenance, site preparation for timber production, conifer release, thinning, right-of-way maintenance, fire protection, and general weed control.

Noxious weed control. Some plant species are noxious or poisonous to humans or animals. Often when forest vegetation is disturbed (as occurs following livestock grazing, logging, road and trail construction, and firebreak construction) these plants are encouraged to grow, and programs must be undertaken to reduce the vegetation or control its spread. Herbicide applications are a frequently used method of control. An annual average of 13,432 acres are treated for noxious weeds on NFS lands. Noxious weeds treated in 1979 included poison ivy and oak, leafy spurge, dalmation toadflax, thistles, knapweed, wyethia, tansy ragwort, and larkspur.

Range improvement and maintenance. Rangelands are an important part of the National Forest System. The grazing resource is of primary importance. However, overgrazing by livestock and/or wildlife, drought conditions, wildfire, or other disturbances can reduce levels of important browse plants and result in an increase in unpalatable or undesirable species. Forage production can also be reduced as a result of natural evolution toward climax vegetation in certain situations. Vegetation management with herbicides modified the evolutionary process and reduces the growth and spread of undesirable species, thus increasing forage availability and benefiting livestock and wildlife production. Of the nearly 100.5 million acres of range associated with NFS lands, 2/ an average of only 11,068 acres are treated annually with pesticides to control such plants such as rabbitbrush, sagebrush, juniper, chaparral, manzanita, and shrub oak.

Site preparation for timber production. A major Forest Service management requirement is regeneration of forest lands to desired timber species within specific time limits. Reestablishing desired tree species following harvest or natural disasters can be difficult because of competing vegetation, which can retard or prevent establishment of desired trees.

2/ The total of commercial forest and range exceeds National Forest areas because some commercial forest is also used as range.

A variety of techniques, including the use of herbicides, are used for site preparation.

Of the 92 million acres of commercial timber land on the National Forests, about 350 to 400,000 acres are treated annually for site preparation. Of this, an average of only 32,028 acres are treated with herbicides. The remainder is accomplished using mechanical, manual, and prescribed burn or combinations of these activities.

Conifer release. On some sites, competing vegetation may overtop or compete for soil moisture and nutrients, thus suppressing the growth of desired conifer species. Control of competing vegetation through the use of herbicides is often required to achieve desired growth rates. The objective of using herbicides to release conifers is not necessarily to kill all competitive vegetation, but to increase the amount of light reaching young conifers in the understory and decrease competition for soil moisture and nutrients. Given 3 to 5 years of improved light and moisture, young conifers on most sites will outgrow the treated bursh and be permanently released. The use of herbicides to accomplish conifer release is very important. Compared to other methods of release, the use of herbicides is relatively high, accounting for about two-thirds of the 200,000 acres treated; however, manual release operations are also significant.

Thinning. It is often necessary to thin conifer stands precommercially to an optimum stand density to promote maximum growth of crop trees. The objectives of thinning are to redistribute growth to fewer trees; sanitize stands by removing disease- and insect-damaged trees, remove trees of poor vigor or form, or those with defects, increase the general vigor and health of the stand, and provide satisfactory tree distribution patterns. Although manual methods of precommercial thinning predominate on the 300,000 acres thinned yearly, herbicides are used on an average of 12,456 acres.

Right-of-way (ROW) maintenance. Rights-of-way across the forest lands represent a large land area under management. For example, private powerlines, pipelines, railroads, and highways traverse more than 60,000 miles of National Forest landscape. In addition, there are 220,000 miles of Forest Service roads that require right-of-way vegetation management. Vegetation management on the rights-of-way benefit the public by improving vehicle travel safety and aesthetics, and by reducing the costs of maintaining the Nation's energy and and transportation lines. Many alternatives are used to accomplish ROW vegetation management. Herbicides are one tool. They are used on the average on nearly 9,979 acres of public rights-of-way.

Fire protection. Fuelbreaks protect all resources of the National Forest System by providing access for wildfire suppression and by creating a discontinuity in the fuel source. They also aid in fireline establishment. Herbicides are used to maintain fuelbreaks economically. An average of 2,822 acres are annually treated for this purpose.

General weed control. The maintenance of recreational, research, and administrative facilities often requires general weed control, both aquatic and terrestrial. Nurseries must also be protected from undesirable vegetation in order to produce quality seedlings for future forests. Herbicides are an important tool in these management activities and account for the remainder of uses on National Forest System lands.

Insect and Disease Prevention and Suppression

Insect Control. Populations of both native and introduced insect species cause considerable economic losses to our Nation's forests. The intensity of control efforts used against insects is directly related to the value of the trees at risk and the type of damage. Prevention, through sound forest management, is the first line of defense against forest insects; however, when an outbreak or epidemic occurs, biological economic, and environmental evaluations may determine that direct control is justified in terms of the value of the forest and human needs. In such cases, insecticides are frequently used. Some of the conventional insecticides most often used for controlling major forest insects are: acephate, carbaryl, malathion, and trichlorfon for forest defoliators; lindane and carbaryl for bark beetles; and carbofuran, acephate and azinphosmethyl for seed and cone insects. Biological insecticides, including the bacterium, Bacillus thuringiensis, and viruses specific to the Douglas-fir tussock and gypsy moths have also been used to reduce populations of these pests and protect conifer foliage. Behavioral chemicals such as attractants, repellents and pheromones are also beginning to see use in integrated forest insect management programs.

Disease control. Biotic disease agents in National Forests can be of considerable economic importance. Management objectives are of fundamental significance in determining the relative importance of specific diseases--as is true for all pests--and subsequently the need for control. Generally, only forest areas that are intensively managed are subject to control of pathogens. Most control strategies are cultural; however, the use of pesticides is important, especially on the several hundred thousand acres of specialty forests such as nurseries, seed orchards, and windbreaks. The most frequently used pesticide for disease control is methyl bromide, a fumigant used to control soil fungi and root rots in nurseries. Benomyl, captan, and chlorothalonil are important fungicides.

Animal Damage Control

Damage from vertebrates on National Forest System lands is usually insignificant compared with the vertebrates aesthetic and recreational value. However, some forest management practices can cause habitat alterations that may lead to abnormal population levels of certain animal species and create conditions that promote local concentrations of potential pests. Most vertebrate damage occurs during the early forest regeneration phase. Important vertebrate pests include deer, elk, bear, rabbits, porcupines, pocket gophers, beaver, and various small rodents. Vertebrate pest populations, especially rodents, are often controlled by using chemical poisons (e.g., baits, repellents, predacides). Strychnine and zinc phosphide are the most used rodenticides. Poisons for controlling vertebrates are usually placed by hand at bait stations, in burrows, or by impregnating conifer seedcoats with pesticides to protect the seeds. Animal repellents are also used to protect plantings of new seedlings.

Research

Forest Service research programs include laboratory studies on the microbiology, biochemistry, synthetic and analytical chemistry, toxicology, screening, bioassay, and formulation of potential pesticidal materials. Field research is conducted on effectiveness for target pest suppression or protection of trees and stands, environmental safety, and effective application techniques.

The major part of Forest Service research on pesticides is concentrated on herbicides for brush and competition control and insecticides for use against damaging insect pest populations.

Research on other pesticides such as fungicides for control of tree diseases represents a minor part of Forest Service research.

Research on herbicides is aimed toward developing appropriate vegetation control measures that can be used in conjunction with various silvicultural operations to release young conifers from brush-and-weed competition and to prepare sites for reforestation or interplanting with additional trees. Research includes studies on the behavior and toxicology of herbicides and their effects on the forest environment. Persistence, movement, and breakdown in vegetation, forest floor, soil, and water are also determined.

Research on insecticides is confined chiefly to three main classes of materials: (1) the conventional chemical insecticides; (2) novel chemicals such as behavioral modifiers and growth regulators; and (3) non-chemical biological materials represented by the microbial (e.g., viruses, bacteria) insecticides. The behavioral modifiers, growth regulators, and microbials represent alternatives to the traditional

chemical toxicants. Alternative materials offer more selective pest control with reduced adverse health and environmental impacts. Of the novel chemicals, insect pheromones have received the most attention by Forest Service researchers. Pheromones are natural products of insects that function to modify behavior and cause insects to aggregate at a food source or attract the opposite sex for mating.

Summary

The pesticide-use tables in the appendix indicate total pesticide use during fiscal year 1979. The total Forest Service acreage treated with pesticides in fiscal year 1979 was 514,782. Herbicides were used on 184,048 acres, 23 percent of which was applied aerially. Insecticides and acaricides were used on 272,420 acres. The major pests treated were spruce budworm, mountain pine beetle, and rangeland grasshoppers. The latter accounted for 70 percent of 1979 insecticide applications. The remainder of pesticide uses in 1979 were ground applications of fungicides, rodenticides, algacides, pisicides, repellents, and fumigants.

SECTION F

RECEIPTS AND OBLIGATIONS

RECEIPTS

Receipts from Forest Service operations in fiscal year 1979 totaled $1.402 billion (table 1). This included $1.085 billion in cash collected; $155 million in roads constructed by timber purchasers in lieu of cash payment; $614,000 collected by the Department of Energy for powerline licenses, and $162 million collected by the Bureau of Land Management for mineral leases on National Forest lands. The RPA Program estimated receipts ranged from a low of $636.4 million to a high of $689.4 million

Receipts from sale or use of National Forest System resources amounted to $881 million in fiscal year 1979, an increase of 16 percent over fiscal year 1978 (table 2). All resources showed a significant gain with minerals being the largest--a 45 percent increase over fiscal year 1978 to $21.878 million.

The receipt gains generally reflect increases due to the inflation trends except minerals. The mineral leases and permit increases are a result of increased activities.

During the fiscal year, $194 million were collected for future expenditures on National Forest lands, an increase of 43 percent. Of these collections, 99 percent is for restoration work on National Forest lands as a result of timber sale activities.

OBLIGATIONS

Obligations for the National Forests and National Grasslands totaled $1,574,091,000, an increase of 21 percent; $16,488,000 was spent performing work for others (table 3).

Because of the moderate fire season in 1979, the expenditures for fighting forest fires (FFF) were $82,638,000 during the fiscal year. This was $93,224,000 below the 3-year average of $175,862,000.

Obligations for research in fiscal year 1979 totaled $116,830,000, an increase of 7 percent. Cooperative research and work for others amounted to $4,337.000.

Obligations in support of State and private activities totaled $92,546,000 during fiscal year 1979, an increase of 24 percent. Work for others was $899,000.

During fiscal year 1979, the Forest Service spent $159,397,000 in support of human resource programs. This was a 3 percent increase over fiscal year 1978; $587,000 was spent on work for others.

Under authority of 16 USC 500, as amended, the Forest Service pays to the States 25 percent of National Forests' receipts to be used for the benefit of public schools and roads in counties containing National Forest lands. This payment, based on fiscal year 1979 receipts, was $276,984,826. Arizona and New Mexico also received $202,830, under authority of 36 Stat. 562, 573. Minnesota received $675,000 under authority of 16 USC 577g.

Counties containing National Grasslands and land utilization areas received $1,372,224 for schools and roads (based on calendar year 1978 receipts).

The estimated RPA range of costs for the 1979 program are: 1/ Research $151.1 to $163.7 million, State and Private Forestry $185.5 to $200.9 million, and National Forest System $1,877.4 to $2,033.9 million. Funds appropriated for the three program areas were; $110.9 million, $80.6 million and $1,330.1 million respectfully. The funding does not include permanent appropriations, trust funds, and allocated funds.

1/ The dollars were inflated to make the original RPA estimates (base year 1976) compare with actual appropriations for Fiscal Year 1979. The inflation factor of 1.344 was used (derived from Table B-3 in the Economic Report of the President, January 1979).

Table 1.--Statement of receipts--fiscal year 1979 (dollars in thousands)

Item	National Forests	Oregon and Calif. grant lands	National Grass-lands and land use areas	Other	Total
Receipts from sale and use of forest resources					
Timber & forest products	796,283	31,318	2		827,603
Grazing	11,325	3	1,192		12,520
Land uses	1,781	25	311		2,117
Recreation	16,403		59		16,462
Power	426		3		429
Mineral leases and permits	15,920		5,958		21,878
Total	842,138	31,346	7,525		881,009
Receipts from deposits for expenditures on NF's					
Timber sale area betterment	111,452				111,452
Timber salvage sales	12,387				12,387
Brush disposal	42,739				42,739
Restoration of improvement	33				33
Cooperative work	27,122				27,122
Total	193,733				193,733
Other receipts					
Misc. (sale, rents, etc.)				8,850	8,850
Golden Eagle passports				4	4
Sale of personal property				108	108
Cooperative research				1,086	1,086
Royalties from sale of Smokey Bear and Woodsy Owl products				107	107
Total				10,155	10,155

Table 1.--Statement of receipts--fiscal year 1979 (dollars in thousands)(con.)

Item	National Forests	Oregon and Calif. grant lands	National Grass-lands and land use areas	Other	Total
Other income					
Estimated collections by Dept. of Energy for power licenses on public domain National Forest land	614				614
Estimated collections by Dept. of Interior for mineral leases, licenses, and permits on public domain National Forest land	162,232				162,232
Estimated value of roads built by timber purchasers in lieu of cash	154,727				154,727
Total	317,573				317,573
Grand Total	1,353,444	31,346	7,525	10,155	1,402,470

Table 2.--Statement of net receipts by region for National Forests, National Grasslands, and land utilization projects--fiscal year 1979 (dollars in thousands)

	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10	Total	Same Period Last Year	Increase or (Decrease)	Percent %
National Forest Receipts													
Timber Purchaser Road Credits 1/	23,130	3,126	3,419	1,571	27,617	70,979	10,256	1,543	13,088	154,727	124,181	30,546	24%
KV Collections	9,993	2,289	6,525	5,678	13,698	55,689	13,405	3,386	788	111,452	95,994	15,458	16%
Timber and Forest Products	44,696	2,170	15,869	9,173	149,538	518,925	49,715	5,913	285	796,284	699,360	96,924	13%
Grazing Eastern States	-	-	-	-	-	-	40	19	-	59	382	-323	-85%
Land Uses	78	274	210	107	513	113	333	117	36	1,781	1,753	28	2%
Recreation	364	2,896	477	874	3,739	1,266	177	494	75	10,362	7,901	2,461	31%
Power	15	25	50	17	126	30	125	33	4	426	386	40	10%
Mineral Leases and Permits	31	36	170	168	73	105	4,144	11,191	1	15,920	10,942	4,978	45%
Admission and User Fees	96	499	388	628	1,816	688	1,013	896	17	6,041	6,075	-34	1%
Grazing Western States	1,072	2,206	3,370	2,919	794	903	2	-	-	11,266	9,006	2,260	25%
Total NFF	46,351	8,106	20,533	13,887	156,601	522,030	55,549	18,662	419	842,138	735,805	106,333	15%
Total National Forest Receipts	79,474	13,521	30,477	21,136	197,916	648,698	79,209	23,591	14,295	1,108,317			
Total Same Period Last Year	62,706	10,641	29,779	25,076	195,602	533,389	69,280	17,066	12,441		955,980	152,338	16%
Increase (Decrease)	16,768	2,880	698	-3,940	2,314	115,309	9,929	6,526	1,854	152,338			
% Increase (Decrease)	26%	27%	2%	-46%	1%	22%	14%	38%	15%	16%			
National Grasslands and LU Projects													
Timber and Forest Products	-1	-		-	-		-	2		2	1	1	-31%
Grazing	314	650	157	17	2	12	30	10		1,192	1,646	-454	-28%
Land Uses	213	67	6			22	2	1		311	82	229	358%
Recreation			3	-				-		3	1	2	50%
Power		1				1				3	2	1	50%
Mineral Leases and Permits	3,763	942	630	-		2	350	271		5,958	3,814	2,144	56%
Admission and User Fees		-	-	-		3	52	1		56	4	52	77%
Total	4,290	1,659	796	17	3	40	435	286		7,525		1,975	36%
Total Same Period Last Year	2,830	1,788	396	10	4	30	333	159			5,550		
Increase (Decrease)	1,460	-129	400	7	-1	10	102	127		1,976			
% Increase (Decrease)	52%	-7%	101%	65%	33%	42%	31%	17%		36%			
Oregon and California Grant Lands													
					185	31,161				31,346	24,185	7,161	22%

Table 3.--Statement of obligations--fiscal year 1979 (dollars in thousands)

Item	Total	Work for others
National Forest System (NFS)		
Protection and maintenance	565,121	9,317
Fighting forest fires	82,638	4,839
Insect and disease control	0 1/	
Cooperative law enforcement	5,035	
Flood prevention and watershed protection	4,176	
Restoration of Forest lands	50	
Reforestation and timber stand improvement	87,766	825
Timber sale betterment (K-V)	73,709	28
Brush disposal	38,303	244
Timber salvage sales	9,595	59
Oregon-California grant lands	4,409	
Land Planning Alpine lakes	253	
Construction and operation of recreation facilities	3,753	1
Range improvements	4,944	
Construction of facilities	37,876	703
Acquisition of lands, Forest Service	3,596	
Acquisition of lands, Land and Water Conservation Fund	65,403	2
Forest roads and trails	295,947	469
Purchaser elections road construction	27,928	
Timber purchaser road construction	217,350	
Restoration of roads - Federal Highway Trust	11,302	1
Cooperative work for others	23,554	
Total NFS	1,562,708	16,488
Research		
Research	109,640	3,169
Research construction	6,022	
Cooperative research	1,168	
Total Research	116,830	3,169

1/ On behalf of the National Forest System, State and Private Forestry obligated $8,711,000 of insect and disease control funds.

Table 3.--Statement of obligations--fiscal year 1979 (dollars in thousands) (con.)

Item	Total	Work for others
State and Private Forestry (S&PF)		
S&PF operations	54,084	554
Insect and disease management	22,662	270
Title IV assistance to States tree plan	1,475	
Resource Conservation and Development (RC&D)	529	
Rural Community Fire Program (RCFP) grants	3,614	
River basins	1,796	69
Flood prevention and watershed planning	4,705	6
Licensee programs, Smokey Bear, and Woodsy Owl	275	
Forestry Incentives Program (FIP), Resource Conservation Program (ACP) and miscellaneous	3,406	
Total S&PF	92,546	899
Human Resource Programs (HRP)		
Youth Conservation Corps	22,260	54
Job Corps	42,818	
Young Adult Conservation Corps (YACC)	80,653	
Senior citizens and miscellaneous	13,666	533
Total HRP	159,397	587
Grand total--Forest Service	1,931,481	21,143

APPENDIX A

RESEARCH PROGRAM

APPENDIX A

RESEARCH PROGRAM

The research programs of the Forest Service are directed by seven technical staff groups, but can be viewed as 11 major activities funded by two budget line items. In addition, there is an International Forestry program, which cuts across most activities. A brief description of the activities follows:

Land and Resource Protection Research (Budget Line Item)

Forest fire and atmospheric sciences. Develops knowledge to integrate forest and range fire control with rural community fire protection and ways to coordinate firefighting with local agencies. Methods to prevent both incendiary fires and fires resulting from human carelessness are investigated and put into operation. Conducts research on controlled fires as a substitute for herbicides and wildfire in the ecological process and management of smoke from prescribed fire. Develops guidelines for meeting air quality standards. Studies methods to balance cost with potential damages from fire in order to be most cost effective and efficient. Conducts research on the economic consequence of fires burning under a wide variety of conditions.

Forest insects and diseases. Develops techniques to minimize forest insect- and pathogen-caused losses and other disturbances in forest, rural, and urban environments and to protect wood in storage and use. Provides technology to detect, measure, and predict the occurrence of diseases and insect pests and to determine their ecological and socio-economic impact. Studies biology, ecology, and behavior of insect and pathogen pests and associated beneficial organisms. Expands methods to control insect and disease pests of trees, forest, and wood products through protection, exclusion, suppression, or sanitation, using silvicultural treatments, biological organisms, genetic resistance, chemicals, or other means that are economically feasible and environmentally acceptable.

Renewable resources evaluation. Provides information on and analysis of the location and condition of forests and forested rangelands in the United States. Includes analysis of present and anticipated uses, demand for, and supply of renewable natural resources. Collectively supplies much of the technical data and analysis needed to prepare the periodic Renewable Resources Assessment as specified by the Forest and Rangeland Renewable Resources Planning Act of 1974 and the National Forest Management Act of 1976.

Renewable resources economics. Provides economic and financial analyses of timber growing, harvesting, processing, and distribution. Includes analyses of ways to reduce obstacles to improved renewable natural resources management. Such obstacles include taxation, ownership patterns, or other institutional aspects. Conducts studies of uses and

demands for forest products including foreign trade patterns. Develops guidelines and methodologies for multiple-use management decisions.

Surface environment and mining. Provides an innovative array of economical and effective surface mine reclamation alternatives to satisfy the Nation's environmental, energy, and mineral needs. Evaluates the effects of surface mining activities on forest and rangeland resources and on its users. Develops, tests, and demonstrates new techniques for planning mining operations. Develops new methods to alleviate the impacts of past and present mining practices on forest and rangelands and to restore mined areas to productivity.

Renewable Resources Management and Utilization Research (Budget Line Item)

Trees and timber management. Develops proper methods for culture of over 100 different tree species. Develops a scientific base for the management of forests for production of timber and related benefits and for modification and improvement of the environment. Provides forest managers with scientific data on the growth and yield of forests. Researches the intensive culture of important forest types to meet growing needs for fiber and energy. Conducts forest genetics research on the production of new strains or hybrids that are superior in growth rate; wood quality; and resistance to insects, diseases, and other damaging factors, or have special value for environmental improvement. Conducts research on timber-related forest products such as naval stores, maple sap, Christmas trees, and other income producing natural products.

Forest watershed management. Provides methods and techniques for protecting and managing forest and rangeland watersheds, which produce two-thirds of the Nation's high-quality water. Develops and tests methods for improving and predicting the quantity, quality, and timing of water yield, including establishment of guidelines and practices to minimize nonpoint source water pollution resulting from various forest land use practices and activities. Evaluates the influence of composition and density of vegetation growing under different soil and climate conditions. Develops procedures for protecting soil and water resources while the watersheds are being managed for timber production, livestock forage, wildlife habitat, and recreational opportunities.

Wildlife, range and fish habitat. Studies the management and use of rangelands with emphasis on revegetation, restoration of range ecosystems, enhancement of productivity, and integration of livestock and forage production with other range resource benefits. Evaluates the ecological responses of forest range types to intensive management of the timber resource. Develops management alternatives for the harmonious production of timber, livestock forage, water, and wildlife habitat.

Develops information on the impacts of alternative land uses on game and nongame fish and wildlife populations and habitats. Develops and tests management systems for population and habitat enhancement. Defines habitat requirements, assesses impacts of alternative land uses,

and develops strategies to optimize the habitat values of forest and range lands.

Researches the maintenance and improvement of habitat for threatened and endangered animal and plant species.

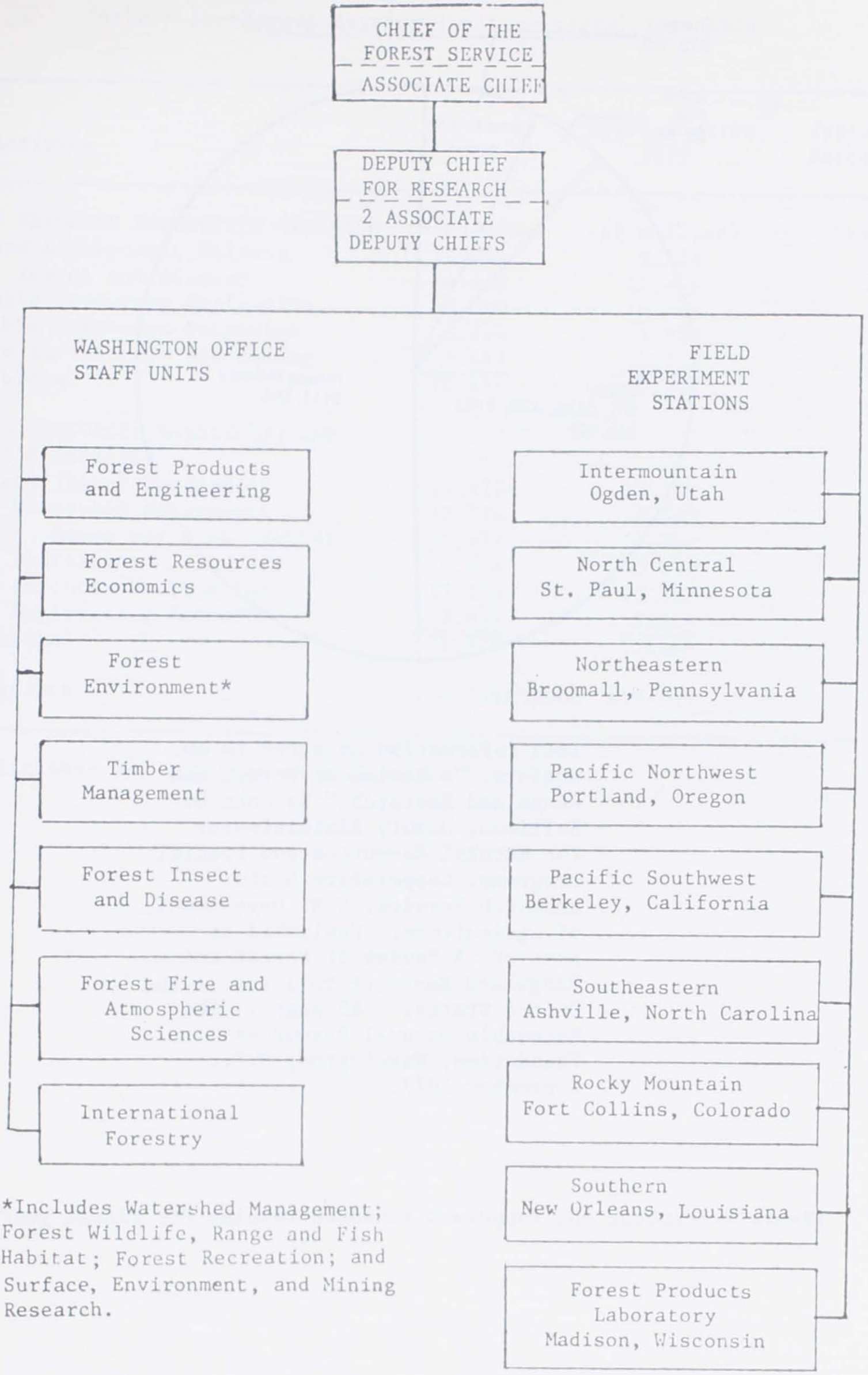
Forest recreation. Provides managers of natural resources with improved technology to substantially increase opportunities for high-quality recreation experiences, while minimizing adverse impacts on the resource and other uses. Develops three kinds of information for managers and decisionmakers: an understanding of factors that influence recreation demand and associated benefits that underlie demands; methods to inventory, protect, and evaluate supply opportunities; and systems that improve management capabilities to design facilities to meet demands, yet preserve natural environments. Develops research knowledge with which to maximize recreation opportunities, while minimizing adverse environmental impacts.

Forest products utilization. Determines the characteristics of wood as a basic raw material for industrial use and improves methods and techniques for its use. Improves wood products through better design and more efficient use of materials. Develops new and more efficient processes for manufacturing wood products through materials research, improvement of processing equipment, reduction of waste, and conservation of manufacturing energy.

Forest engineering research. Improves the engineering aspects of wood harvesting and transportation systems through operations research, methods analysis, equipment design, and pilot testing. Protects quality of timber stands and watersheds, provides for reestablishment of forests and improvement of timber stands, and maintains quality of the forests for multiple use. Develops harvesting systems to remove some of the barriers to increased use of small and low-quality timber, dead or dying timber, and forest residues--particularly as an energy source.

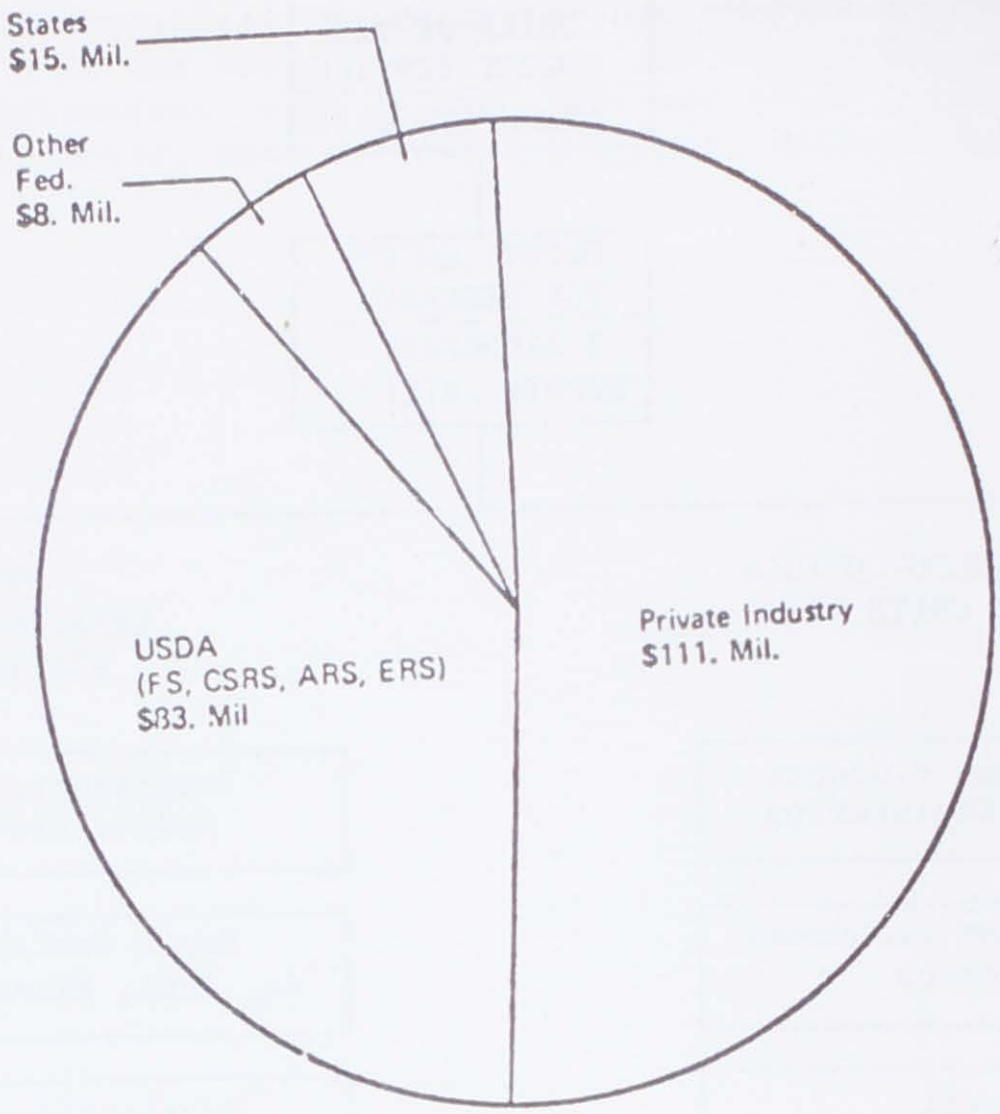
International forestry. Provides leadership, coordination, and direction for Forest Service cooperation and participation in international forestry programs such as the Man and the Biosphere Program and tropical forestry initiatives. Arranges for Forest Service employees to provide technical assistance to developing countries through the Agency for International Development (AID) and the Food and Agriculture Organization (FAO) of the United Nations. Is responsible for all Forest Service, science and technology bilateral agreements, including arranging for the exchange of scientists and publications. Maintains liaison for all Special Foreign Currency Research Program Projects in Forestry (under P.L. 480). Coordinates foreign travel plans for all Forest Service travelers. Monitors and is the liaison office for all foreign travel, obtaining necessary approval for travel from the Department of Agriculture and the Department of State. Facilitates training for all foreign visitors, arranging appointments with Forest Service offices, universities, and industry, including assistance in planning academic training for foreign students. Cooperates on many programs with other

U.S. Government agencies, including the Departments of State, Commerce, Interior, Housing and Urban Development, and others and with international organizations, such as FAO, AID, and other forestry agencies throughout the world, such as those in Canada, Mexico, Brazil, etc.



*Includes Watershed Management; Forest Wildlife, Range and Fish Habitat; Forest Recreation; and Surface, Environment, and Mining Research.

Figure 1.--Administrative organization of the research arm of the Forest Service, U.S. Department of Agriculture.



SOURCE:

This information appeared in an article, "A Review of Forest and Rangeland Research," by John D. Sullivan, Deputy Administrator for Natural Resources and Special Programs, Cooperative State Research Service, U.S. Department of Agriculture. Published as part of "A Review of Forest and Rangeland Research Policies in the United States." 45 pages. The Renewable Natural Resources Foundation, Washington, D.C., September 1977.

Figure 2.--Forest and rangeland research funding for fiscal year 1975.

Table A 1.--Forest Service funding--fiscal year 1979

Activity	RPA level 1979	Appropriation 1979 [1/]	Appropriation Percent of RPA
LAND AND RESOURCE PROTECTION RESEARCH	($ million)	($ million)	(Percent)
Fire and Atmospheric Science	14.064	9.728	69.2
Forest Insect and Disease	28.170	21.456	76.2
Renewable Resources Evaluation	18.340	14.104	76.9
Renewable Resrouces Economics	6.244	4.950	79.5
Surface Environment and Mining	3.643	3.155	86.6
Subtotal	70.461	53.393	75.8
RENEWABLE RESOURCES MANAGEMENT AND UTILIZATION RESEARCH			
Trees and Timber Management	23.923	19.754	82.6
Forest Watershed Management	12.226	9.665	79.1
Wildlife, Range and Fish Habitat	11.657	8.987	77.1
Forest Recreation	4.974	3.296	66.3
Forest Products Utilization	17.246	13.518	78.4
Forest Engineering Research	3.813	2.334	61.2
Subtotal	73.839	57.554	77.9
Total Research	144.300	110.947	76.9

1/ Includes Pay Act supplemental of 2.781 million.

Table A 2.--Summary of extramural research funded by the Forest Service--fiscal year 1979

Type of Grantee	P.L. 95-307 Cooperative Agreements No.	P.L. 95-307 Cooperative Agreements Dollars	P.L. 95-307 P.L. 89-106 Research Grants No.	P.L. 95-307 P.L. 89-106 Research Grants Dollars	P.L. 79-733 Research Contracts No.	P.L. 79-733 Research Contracts Dollars	P.L. 83-480 Foreign Grants No.	P.L. 83-480 Foreign Grants Dollars Equiv.	Total No.	Total Dollars
Land-Grant Institutions	360	5,257,443	56	1,531,925	--	--	--	--	416	6,789,388
1980 Land-Grant Institutions	--	--	--	--	--	--	--	--	--	--
Non-Land-Grant Institutions	99	1,260,563	28	701,298	--	--	--	--	127	1,961,861
Subtotal, Colleges and Universities	459	6,518,006	84	2,233,223	--	--	--	--	543	8,751,229
Non-Education Type Grantee	49	878,653	7	245,117	3	103,895	--	--	59	1,227,647
Subtotal, Domestic	508	7,396,641	91	2,478,340	3	103,895	--	--	602	9,978,876
SEA/CR	--	--	18	986,827	--	--	--	--	18	986,827
TOTAL DOMESTIC	508	7,396,641	109	3,465,167	3	103,895	--	--	620	10,965,703
Foreign Institutions	--	--	--	--	--	--	16	2,150,559	16	2,150,559
GRAND TOTAL	508	7,396,641	109	3,465,167	3	103,895	16	2,150,559	636	13,116,262

Table A 3.--Summary of extramural research funds received by the Forest Service--fiscal year 1979

Source of Funds	Total
U. S. Department of Interior	$1,017,819
Environmental Protection Agency	1,790,722
Agency for International Development	25,700
Department of Defense	175,005
Department of Commerce	10,000
Department of Labor	2,300
Department of Energy	590,400
Department of Housing and Urban Development	13,000
S.E.A.--Federal Research	1,300
Tennessee Valley Authority	12,000
Energy Research and Development Administration	35,000
State of California	159,300
State of Hawaii	165,900
State of Colorado	17,600
State of West Virginia	15,000
Florida Division of Forestry	60,500
Georgia Forestry Commission	76,300
Lilly Research Laboratories	3,000
Shell Oil Company	4,500
Sophers Wheeler Company	64,400
Washington Irrigation and Development Company	2,000
Weyerhaeuser Corporation	64,690
Solar Energy Research Institute	33,002
Other (Several Small Sources)	93,600
Total	$4,433,038

Table A 4.--Research manuscripts published in fiscal year 1979 by major subject area

Subject area	Number of publications
ENVIRONMENT RESEARCH	
Watershed Management	143
Wildlife	137
Range	55
Fisheries Habitat	17
Forest Recreation	64
Urban Forestry	70
Total	486
INSECT AND DISEASE RESEARCH	
Insect Detection and Evaluation	56
Insect Biology	59
Insect Control and Management Strategies	96
Disease Detection and Evaluation	18
Disease Biology	73
Disease Control and Management Strategies	41
Air Pollution	14
Wood Products Organisms	25
Total	382
FIRE AND ATMOSPHERIC SCIENCES RESEARCH	
Fire Prevention, Hazard Reduction, and Prescribed Burning	16
Fire Management Methods and Systems	29
Forest Fire Science	12
Ecological Relations	21
Weather Modification and Weather Effects	17
Total	95
TIMBER MANAGEMENT RESEARCH	
Biological Relations	190
Silviculture	143
Management Mensuration	67
Genetics and Tree Improvement	84
Special Products	117
Total	601

Table A 4.--Research manuscripts published in fiscal year 1979 by major subject area (con.)

Subject area	Number of publications
ECONOMICS AND MARKETING RESEARCH	
Forest Resource Evaluation	75
Forest Economics	58
Supply, Demand, and Price Analysis	29
Total	162
PRODUCTS AND ENGINEERING RESEARCH	
Improving Forest Engineering Systems	21
Wood Engineering	35
Wood Chemistry and Fiber Products	49
Utilization Potential and Processing of Wood	123
Total	228
GRAND TOTAL	1,954

APPENDIX B

STATE AND PRIVATE FORESTRY PROGRAM

Table B 1.--Summary of selected cooperative forest management and processing program activities--fiscal years 1940-1979

Summary	Progress			
	Woodland owners assisted	Area of woodland involved	Timber sale assistance--volume marked	Loggers and processors assisted
Fiscal Year	(Number)	(Acres)	(M bd. ft.)	(Number)
1940	--	--	--	--
1941	165	49,416	2,667	--
1942	224	92,442	10,076	--
1943	3,242	359,388	75,600	--
1944	8,842	742,697	323,557	--
1945	8,093	831,347	411,330	--
1946	12,083	1,321,746	452,367	--
1947	13,531	1,576,888	502,312	--
1948	14,220	1,399,971	503,641	--
1949	17,140	1,769,240	437,903	--
1950	22,828	2,542,564	518,566	--
1951	25,352	2,558,091	721,938	6,451
1952	27,933	2,501,317	609,562	9,429
1953	32,474	2,827,709	527,419	9,579
1954	32,224	2,557,993	538,391	8,429
1955	34,828	2,914,026	549,373	8,182
1956	38,121	3,124,744	625,592	9,254
1957	44,494	3,086,143	538,958	7,933
1958	58,752	3,435,719	444,797	8,926
1959	76,546	4,146,146	659,850	10,846
1960	82,188	4,115,612	569,178	8,099
1961	89,254	4,612,957	459,325	8,325
1962	91,418	4,797,106	547,787	8,126
1963	101,823	5,762,008	588,046	9,146
1964	97,036	6,140,678	668,274	8,691
1965	99,074	6,164,998	716,950	9,248
1966	105,014	6,552,831	906,009	9,825
1967	107,654	6,232,122	785,907	12,545
1968	106,328	7,774,941	704,241	11,097
1969	109,835	7,884,127	855,336	13,347
1970	115,197	6,945,456	1,225,520	13,620
1971	127,828	7,936,595	860,950	14,627
1972	274,001	11,158,328	955,627	5,290
1973	106,422	6,471,894	1,578,664	4,855
1974	117,990	7,105,606	907,311	5,353
1975	140,940	10,368,738	677,532	5,405
1976	105,184	4,085,126	596,599	15,318
1976-77 (TQ)	25,253	1,009,677	220,649	5,849
1978	165,329	5,750,049	1,120,743	12,749
1979	183,585	5,382,230	755,103	11,393

Table B 2.--Summary of selected cooperative forest management and processing activities by State--fiscal year 1979

State/ Commonwealth/ Territory	Assists to woodland owners	Progress Area of woodland involved	Area receiving[1/] planting and TSI assistance	Timber sale assistance-- volume marked	Assists to loggers and processors	Improved utilization	State nursery production
	(number)	(acres)	(acres)	(M bd. ft.)	(number)	(M cu. ft.)	(M trees)
Alabama	9,760	267,335	56,228	30,177	252	5,474	71,913
Alaska	134	29,400	8,400	48,000	21	2,000	300
Arizona	179	3,390	564	604	7	42	0
Arkansas	2,078	113,047	19,773	3,043	200	2,515	9,768
California	3,937	44,286	17,506	8,847	171	7,023	4,277
Colorado	7,741	51,903	6,677	7,121	318	2,589	1,874
Connecticut	1,673	27,216	3,726	2,804	13	119	2,176
Delaware	1,105	10,536	551	3,600	58	217	301
Florida	3,746	265,494	20,597	3,658	913	3,162	21,724
Georgia	17,178	661,503	27,064	19,919	518	11,219	47,222
Guam	81	53	31	0	0	0	23
Hawaii	608	33,473	473	543	56	1,230	371
Idaho	533	8,512	1,441	5,315	125	171	659
Illinois	1,873	27,113	4,752	8,932	52	600	5,593
Indiana	3,370	117,136	13,362	11,287	381	4,367	4,300
Iowa	2,969	23,026	3,048	2,543	301	1,920	1,984
Kansas	1,943	34,542	1,998	4,310	178	482	1,073
Kentucky	3,463	105,613	5,662	19,338	153	2,289	14,533
Louisiana	2,477	160,073	19,721	9,705	19	426	77,500
Maine	2,989	43,224	7,324	8,976	1,737	3,685	2,174
Maryland	2,942	27,610	4,187	4,929	272	2,703	2,783
Massachusetts	3,024	167,073	9,890	27,215	161	2,088	0
Michigan	2,386	94,705	14,744	7,219	32	904	6,707
Minnesota	4,928	71,766	16,626	14,267	151	3,312	12,000
Mississippi	7,522	288,274	55,581	15,909	593	40,808	58,313
Missouri	2,839	140,042	11,840	38,910	768	1,557	10,564
Montana	544	11,121	2,162	35	140	1,959	1,646
Nebraska	792	4,626	745	1,291	7	0	3,200
Nevada	304	2,513	502	0	3	131	120
New Hampshire	4,853	70,765	7,716	6,483	334	3,182	652
New Jersey	1,654	47,384	3,245	2,267	643	1,895	433
New Mexico	564	24,196	1,236	407	21	977	7
New York	4,791	135,254	13,290	30,542	692	3,430	7,588
North Carolina	11,677	509,508	45,295	90,474	92	1,022	56,900
North Dakota	617	15,485	299	130	23	22	3,720
Ohio	3,601	84,456	10,394	19,209	60	2,502	6,012
Oklahoma	536	18,575	3,089	746	9	9	5,543
Oregon	10,950	229,301	25,636	51,514	53	5,494	28,000
Pennsylvania	1,641	37,036	7,510	2,049	185	1,189	5,618
Puerto Rico	1,670	1,670	1,434	0	12	0	545
Rhode Island	146	3,936	451	127	0	0	0
South Carolina	10,400	283,220	29,119	32,739	30	2,996	41,663
South Dakota	646	11,257	271	7,224	0	0	771
Tennessee	5,125	124,528	3,605	36,102	39	646	15,110
Texas	2,341	163,360	24,399	13,647	19	5,119	20,748
Utah	315	19,267	284	3,013	89	1,086	170
Vermont	4,325	30,020	5,369	24,389	87	3,621	240
Virginia	14,178	403,405	41,231	28,177	792	3,100	51,743
Virgin Islands	22	59	42	0	0	0	8
Washington	1,935	79,125	8,783	42,598	215	10,816	17,350
West Virginia	2,000	43,840	13,856	14,370	198	4,293	4,885
Wisconsin	6,286	172,063	28,266	36,455	39	299	13,918
Wyoming	194	38,795	240	3,944	161	3,063	0
U.S. Total	183,585	5,382,230	610,235	755,103	11,393	157,753	644,722

1/ Includes both areas receiving technical assistance only and technical assistance as a part of cost-sharing through FIP and ACP.

Table B 3.--Summary of selected cooperative forest management and processing program activities by Forest Service Regions and Areas--fiscal year 1979

Assistance activity	Unit of measure	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 10	Southeastern Area	Northeastern Area	Total
Assists given forest landowners, loggers, processors:	Number	1,982	11,980	771	711	4,853	13,153	155	95,814	65,559	194,978
Forest Management Plans prepared:											
New.	Number	230	735	62	55	189	1,553	2	19,962	17,046	39,834
. . . . .	Acres	15,979	42,150	19,097	16,621	12,862	201,399	15,000	1,847,082	802,789	2,972,979
Revised.	Number	80	94	23	10	33	525	0	5,995	2,044	8,803
. . . . .	Acres	3,752	2,346	940	1,103	1,814	22,784	0	390,999	100,166	523,904
Tree planting:											
For timber production.	Acres	644	771	59	35	7,725	11,764	5,000	266,592	47,453	340,043
For erosion control.	Acres	25	93	27	73	1,056	1	0	2,081	827	4,183
For surface mine reclamation. .	Acres	3	82	15	0	350	0	0	3,736	1,233	5,419
Direct seeding.	Acres	0	217	0	78	70	0	3,000	10,662	1,511	15,538
Timber stand improvement.	Acres	3,125	4,508	1,428	485	6,295	22,654	0	73,234	116,882	228,611
Outdoor recreation development. .	Acres	11,117	3,603	204	5	6,784	0	0	20,147	29,994	71,854
Wildlife habitat development. . .	Acres	110	24,445	623	160	5,999	19	0	136,224	51,344	218,924
Forested range improvement. . . .	Acres	283	21,576	1,181	2,490	13,073	40	0	5,603	0	44,246
Timber sale assistance:											
Preparation.	Acres	719	19,029	1,428	223	7,994	20,805	3,000	139,831	133,616	326,645
. . . . .	M Cu. Ft.	1,096	5,964	360	521	2,326	17,205	8,000	78,643	62,168	176,283
Harvested	Acres	184	17,213	2,811	328	743	17,840	3,000	107,513	87,371	237,003
. . . . .	M Cu. Ft.	702	10,780	205	493	954	16,795	10,000	101,759	44,310	185,998
Harvesting assistance to loggers.	M Cu. Ft.	498	4,828	504	694	2,652	4,144	2,000	19,898	21,331	56,549
Processing assistance to operators.	M Cu. Ft.	1,652	1,171	473	338	5,600	12,166	0	57,318	18,327	97,045
Wood drying assistance	M Cu. Ft.	0	135	42	183	0	0	0	1,502	1,376	3,238
Processor marketing assistance..	Assists	137	161	4	29	64	139	20	1,627	2,268	4,449
Urban forestry assistance activities	Areas assisted	28	514	44	43	259	142	2	4,309	1,351	6,692
Referrals to consultants	Number	59	40	11	3	695	522	5	4,292	5,084	10,711

APPENDIX C

NATIONAL FOREST SYSTEM PROGRAM

Table C 1.--National Forest System lands by States administered by the Forest Service as of September 30, 1979 (acres)

State and commonwealth	National Forest purchase units, research areas, and other areas	National Grasslands	Land utilization project	Total
Alabama	643,035	0	40	643,075
Alaska	20,159,994	0	0	20,159,994
Arizona	11,270,186	0	0	11,270,186
Arkansas	2,471,207	0	0	2,471,207
California	20,324,100	0	19,225	20,343,325
Colorado	13,802,484	612,145	560	14,415,189
Connecticut (Forest Insect and Disease Lab.)	10	0	0	10
Florida	1,094,285	0	0	1,094,285
Georgia	850,628	0	9,340	859,968
Hawaii	1	0	0	1
Idaho	20,375,432	47,659	0	20,423,091
Illinois	258,601	0	0	258,601
Indiana	183,557	0	324	183,881
Kansas	0	107,700	0	107,700
Kentucky	665,522	0	0	665,522
Louisiana	597,639	0	0	597,639
Maine	50,977	0	724	51,701
Michigan	2,714,957	0	999	2,715,956
Minnesota	2,794,985	0	0	2,794,985
Mississippi	1,140,110	0	0	1,140,110
Missouri	1,447,236	0	13,104	1,460,340
Montana	16,750,656	0	0	16,750,656
Nebraska	257,165	94,334	0	351,499
Nevada	5,143,891	0	0	5,143,891
New Hampshire	694,169	0	0	694,169
New Mexico	9,106,961	136,412	240	9,243,613
New York	0	0	13,232	13,232
North Carolina	1,158,936	0	0	1,158,936
North Dakota	796	1,104,749	0	1,105,545
Ohio	173,478	0	0	173,478
Oklahoma	246,543	46,300	0	292,843
Oregon	15,503,507	106,138	856	15,610,501
Pennsylvania	508,695	0	0	508,695
Puerto Rico	27,846	0	0	27,846
South Carolina	608,132	0	0	608,132

Table C 1.--National Forest System lands by States administered by the Forest Service as of September 30, 1979 (acres) (con.)

State and commonwealth	National Forest purchase units, research areas, and other areas	National Grasslands	Land utilization project	Total
South Dakota	1,132,018	863,059	0	1,140,110
Tennessee	621,204	0	0	621,204
Texas	664,365	117,558	0	781,923
Utah	8,046,181	0	0	8,046,181
Vermont	271,465	0	0	271,465
Virginia	1,612,091	0	0	1,612,091
Virgin Islands (Estate Thomas Experimental Forest)	147	0	0	147
Washington	9,066,455	0	725	9,067,180
West Virginia	965,750	0	0	965,750
Wisconsin	1,496,773	0	160	1,496,933
Wyoming	8,680,728	572,359	0	9,253,087
Total	183,582,898	3,808,413	59,529	187,450,840

Table C 2.--Summary of recreation activities on National Forest lands by State--fiscal year 1979 (thousands of recreation visitor-days[1/]

STATE NAME	CAMPING	PICNICKING	REC. TRAVEL (MECHANIZED)	BOATING	GAMES & TEAM SPORTS	WATERSKIING AND OTHER WATER SPORTS	SWIMMING AND SCUBA DIVING	WINTER SPORTS	FISHING	HUNTING
ALABAMA	193.6	71.5	329.5	39.4	.7	13.5	86.1		76.2	213.6
ALASKA	865.6	71.3	380.6	643.2	13.5	1.0	25.9	200.2	598.1	158.9
ARIZONA	4,038.6	863.3	3,596.0	476.6	98.6	57.6	265.7	164.1	666.9	685.8
ARKANSAS	551.8	169.4	523.8	129.6	14.1	27.5	209.9		340.3	461.2
CALIFORNIA	14,083.6	1,250.0	13,885.8	1,307.2	266.9	267.8	1,641.8	3,781.3	3,167.4	1,423.4
COLORADO	5,091.5	772.4	4,887.0	202.5	20.5	9.4	44.4	4,440.2	1,567.4	936.4
FLORIDA	1,019.3	410.2	242.7	189.7	6.0	27.9	205.3		316.5	447.0
GEORGIA	413.6	54.5	432.2	58.4	2.9	33.4	35.3	2.1	208.5	313.8
IDAHO	2,796.5	431.4	2,364.1	398.9	36.8	39.5	174.6	575.2	920.3	815.4
ILLINOIS	143.3	52.6	158.1	26.7	3.3	4.7	22.4		35.3	171.1
INDIANA	183.6	24.3	104.9	81.1		25.2	26.4		120.3	77.2
KANSAS	1.4	6.5	18.6	.1	.1		.1	.1	.5	1.8
KENTUCKY	366.6	119.0	674.6	359.3	7.4	64.4	42.2	.7	234.8	175.5
LOUISIANA	131.0	32.8	77.9	10.0	2.7	4.2	24.7		45.8	92.5
MAINE	16.7	3.8	11.8	.2	1.2		.1	22.8	4.3	9.3
MICHIGAN	931.7	144.0	1,949.4	244.1	5.9	7.0	118.1	144.6	385.3	624.4
MINNESOTA	1,193.7	59.4	605.8	615.5	12.2	28.4	109.1	113.1	708.5	271.8
MISSISSIPPI	186.6	61.2	221.7	71.7	1.8	6.4	81.6		52.6	408.7
MISSOURI	304.7	69.9	388.6	103.8	7.7	7.4	58.5		87.9	242.3
MONTANA	1,719.7	364.7	2,160.5	186.8	26.5	33.9	74.1	551.5	711.8	753.2
NEBRASKA	21.1	21.7	15.5	1.0	1.9	.1	2.1		7.4	27.4
NEVADA	479.6	195.6	279.3	3.4	26.8	.2	61.5	197.1	62.5	119.1
NEW HAMPSHIRE	559.6	60.9	309.4	4.3	1.4	4.7	37.6	310.7	21.0	30.0
NEW MEXICO	1,349.3	492.1	974.6	18.4	24.9		41.2	422.9	396.5	421.7
NEW YORK	8.9	2.0	1.2					.7	.8	3.5
NORTH CAROLINA	822.0	276.7	1,088.7	145.2	7.5	25.7	187.7	1.5	291.3	603.2
NORTH DAKOTA	10.7	6.6	21.7	2.3	.1		.9	1.9	7.4	52.3
OHIO	41.1	24.0	91.8	8.0	2.2	.4	8.2	.4	20.2	114.6
OKLAHOMA	48.4	24.5	159.7	10.3		.1	11.1		20.2	57.4
OREGON	5,277.5	648.2	3,164.1	688.1	42.0	74.1	353.2	956.4	1,311.6	1,223.5
PENNSYLVANIA	542.2	41.3	371.0	91.4	1.4	5.8	27.2	1.4	226.8	420.6
SOUTH CAROLINA	156.8	48.1	255.2	67.9	11.3	12.9	13.1		82.1	225.7
SOUTH DAKOTA	288.4	58.9	1,223.2	38.4	8.1	6.7	25.5	52.9	80.0	118.8
TENNESSEE	526.8	172.0	381.3	71.5	10.5	20.9	117.1	.3	123.7	191.9
TEXAS	436.3	39.2	203.7	67.0		24.6	39.9		851.4	164.4
UTAH	3,979.5	720.1	2,612.2	228.2	75.1	21.4	104.8	591.6	1,112.1	807.4
VERMONT	58.1	12.9	53.4	1.9	1.8		7.6	320.3	4.3	25.2
VIRGINIA	687.7	157.8	832.1	18.8	16.9	1.5	45.2	4.3	294.7	545.6
WASHINGTON	3,747.2	355.6	2,331.7	208.3	32.0	14.2	93.8	1,342.4	696.7	961.2
WEST VIRGINIA	428.4	33.5	247.8	8.2	11.8		15.0	.6	155.4	217.1
WISCONSIN	886.0	31.1	597.1	111.5	.2	10.0	83.3	26.7	176.8	302.7
WYOMING	1,347.2	185.4	1,282.9	132.2	23.6	5.5	44.7	257.0	584.4	411.3
PUERTO RICO	4.4	233.8	25.3		4.5		65.3			
SERVICE WIDE	54,780.3	8,874.2	49,536.5	7,072.1	832.8	888.0	4,632.3	14,485.0	16,776.0	15,327.9

1/ One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table C 2.--Summary of recreation activities on National Forest lands by States--fiscal year 1979 (thousands of recreation visitor-days[1/]) (con.)

STATE NAME	HIKING & MOUNTAIN CLIMBING	HORSEBACK RIDING	RESORT USE	ORG. CAMP USE	REC. RES. USE	GATHERING FOREST PRODUCTS	NATURE STUDY	VIEWING SCENES, SPORTS ENVIRONMENT	VIS. EXHIBITS TALKS, ETC	TOTAL USE	PERCENT OF TOTAL
ALABAMA	50.3	15.3				31.7	12.0	3.2	17.3	1,153.9	.5
ALASKA	144.9	3.5	17.4	9.3	27.9	17.3	11.2	166.6	379.6	3,236.0	1.5
ARIZONA	749.4	296.3	281.3	273.3	432.9	263.6	110.0	337.6	241.5	13,839.1	6.3
ARKANSAS	97.2	39.9	34.4	12.7	8.5	32.8	11.8	39.0	78.7	2,782.6	1.3
CALIFORNIA	2,335.0	518.4	1,435.8	1,992.8	3,395.3	574.2	298.1	2,125.9	576.1	54,326.3	24.7
COLORADO	1,237.9	370.5	324.9	142.3	281.4	289.1	134.6	999.0	288.0	22,039.4	10.0
FLORIDA	45.5	28.8		50.3	120.3	29.5	15.8	40.8	33.5	3,229.1	1.5
GEORGIA	182.2	19.1		16.2	16.5	9.7	9.6	62.4	28.8	1,899.2	.9
IDAHO	377.6	226.2	166.3	139.2	295.7	356.3	40.1	194.8	191.6	10,540.5	4.8
ILLINOIS	48.6	50.7				6.3	3.0	68.4	34.5	829.0	.4
INDIANA	39.2	22.3				15.7	7.0	1.6	10.8	739.6	.3
KANSAS	.5	.2				.2	.8			30.9	
KENTUCKY	239.1	35.9	8.5	11.7	11.2	15.4	8.2	105.4	81.8	2,561.7	1.2
LOUISIANA	43.4	6.3		12.7	23.3	13.2	2.7	6.7	13.6	543.5	.2
MAINE	5.8			1.1		.5	2.2	2.9	2.8	85.5	
MICHIGAN	93.6	33.9	3.2	19.6	77.4	55.4	23.9	103.4	50.8	5,015.7	2.3
MINNESOTA	75.3	6.0	81.5	29.2	148.9	52.5	15.1	12.9	50.4	4,150.3	1.9
MISSISSIPPI	33.2	19.9		42.8		14.7	6.5	7.7	16.7	1,227.8	.6
MISSOURI	59.3	21.6		23.4		23.7	8.8	32.2	16.8	1,456.6	.7
MONTANA	411.2	243.2	73.3	90.2	237.6	197.5	49.4	192.8	251.7	8,329.6	3.8
NEBRASKA	10.4	3.7		8.6		9.9	8.1	3.9	8.5	151.3	.1
NEVADA	74.0	40.3	79.0	55.6	21.8	46.8	13.1	40.6	281.6	2,077.9	.9
NEW HAMPSHIRE	577.6	.7	69.7	1.6		3.8	17.5	348.8	21.6	2,380.9	1.1
NEW MEXICO	349.7	117.2	18.0	51.5	68.8	366.1	26.8	217.2	154.2	5,511.1	2.5
NEW YORK	1.4	.9				.9	.4			20.7	
NORTH CAROLINA	430.1	54.7	6.3		7.7	81.6	25.2	303.7	131.8	4,490.6	2.0
NORTH DAKOTA	2.0	2.8				2.1	.4	7.5	1.9	120.6	.1
OHIO	17.3	11.1				9.9	4.8	1.3	6.5	361.8	.2
OKLAHOMA	12.0	3.5				4.2	2.1	33.9	13.4	392.8	.2
OREGON	855.8	203.9	822.9	273.6	413.6	462.1	117.0	718.5	410.7	18,016.8	8.2
PENNSYLVANIA	62.1	5.6	1.7	18.7	49.4	27.3	7.1	135.8	15.1	2,051.9	.9
SOUTH CAROLINA	28.1	23.4				18.9	9.9	12.3	20.5	986.2	.4
SOUTH DAKOTA	55.0	22.9	18.0	30.7	81.6	29.3	17.2	28.2	27.3	2,211.1	1.0
TENNESSEE	126.8	23.7	26.8	29.8	91.2	15.8	7.7	67.2	24.6	2,029.6	.9
TEXAS	19.8	5.6	22.0			3.1	7.8	42.0	15.0	1,841.8	.8
UTAH	536.9	250.2	326.6	189.4	288.4	233.8	48.0	268.9	106.5	12,501.1	5.7
VERMONT	29.1	1.4	19.0	9.9	1.0	1.3	.5	15.4	1.7	558.8	.3
VIRGINIA	199.6	68.2	.5	18.8	.6	96.4	20.0	248.3	35.5	3,292.5	1.5
WASHINGTON	910.5	212.5	256.6	362.5	321.6	355.6	67.5	1,130.3	176.3	13,576.5	6.2
WEST VIRGINIA	75.3	5.7		35.4	.7	10.0	4.1	11.7	20.2	1,280.9	.6
WISCONSIN	29.5	8.0	2.3	1.5	8.0	75.8	5.8	5.4	20.1	1,881.8	.9
WYOMING	442.9	142.4	243.9	96.5	216.3	60.0	26.8	140.4	73.6	5,717.0	2.6
PUERTO RICO	61.8		29.5	35.9	4.0	2.1	2.3	36.5	190.2	695.6	.3
SERVICE WIDE	11,176.9	3,166.4	4,388.9	4,086.8	6,651.6	3,916.1	1,210.9	8,321.1	4,121.8	220,165.6	100.0

Table C 3.--Summary of recreation activities on National Forest lands by Region--fiscal year 1979 (thousands of recreation visitor-days[1/])

REGION	CAMPING	PICNICKING	REC. TRAVEL (MECHANIZED)	BOATING	GAMES & TEAM SPORTS	WATERSKIING AND OTHER WATER SPORTS	SWIMMING AND SCUBA DIVING	WINTER SPORTS	FISHING	HUNTING
01	2,687.5	521.8	3,034.8	396.4	35.8	46.7	157.1	628.4	933.2	1,192.0
02	6,238.8	970.3	6,972.3	261.3	37.0	16.9	73.1	4,550.1	1,952.4	1,375.3
03	5,409.4	1,382.6	4,588.1	511.2	123.5	65.9	317.3	587.0	1,085.6	1,116.2
04	7,384.5	1,287.6	5,121.0	545.7	147.0	54.7	254.2	1,432.3	2,297.9	1,531.2
05	13,587.6	1,234.4	13,592.9	1,297.6	266.6	266.2	1,688.8	3,840.9	3,036.2	1,370.9
06	9,030.5	1,003.0	5,525.6	896.4	74.0	88.3	448.3	2,295.9	2,009.8	2,181.8
08	5,482.6	1,849.4	5,482.8	1,223.2	86.7	254.7	1,157.9	9.1	2,928.0	3,933.8
09	4,678.8	553.8	4,838.4	1,297.1	48.7	93.6	509.7	941.1	1,934.8	2,467.8
10	885.6	71.3	380.6	643.2	13.5	1.0	25.9	200.2	598.1	158.9
SERVICE WIDE	54,780.3	8,874.2	49,536.5	7,072.1	832.8	888.0	4,632.3	14,485.0	16,776.0	15,327.9

1/ One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table C 3.--Summary of recreation activities on National Forest lands by Region--fiscal year 1979 (thousands of recreation visitor-days[1/]) (con.)

REGION	HIKING & MOUNTAIN CLIMBING	HORSEBACK RIDING	RESORT USE	ORG. CAMP USE	REC. RES. USE	GATHERING FOREST PRODUCTS	NATURE STUDY	VIEWING SCENES, SPORTS ENVIRONMENT	VIS. EXHIBITS TALKS, ETC	TOTAL USE	PERCENT OF TOTAL
01	558.2	327.0	181.8	91.2	295.2	269.4	65.5	255.6	354.3	11,871.9	5.4
02	1,462.9	455.6	556.9	230.6	534.7	365.8	181.0	1,097.0	362.8	27,689.8	12.6
03	1,100.3	413.8	251.8	324.8	501.7	629.7	139.1	555.0	403.3	19,505.8	8.9
04	1,183.2	544.0	578.4	430.7	621.5	608.3	94.6	825.4	513.9	25,456.1	11.6
05	2,278.8	492.9	1,420.2	1,992.8	3,366.7	556.7	295.5	1,823.0	574.9	52,993.6	24.1
06	1,766.6	417.7	1,079.5	636.1	735.2	816.7	184.5	1,849.8	587.9	31,627.6	14.4
08	1,571.6	347.4	116.8	230.9	284.0	373.5	139.8	1,011.9	694.6	27,177.9	12.3
09	1,110.4	164.5	177.4	140.4	284.7	278.7	99.7	736.8	250.5	20,606.9	9.4
10	144.9	3.5	17.4	9.3	27.9	17.3	11.2	166.6	379.6	3,236.0	1.5
SERVICE WIDE	11,176.9	3,166.4	4,388.9	4,086.8	6,651.6	3,916.1	1,210.9	8,321.1	4,121.8	220,165.6	100.0

Table C 4.--Use of Forest Service dispersed recreation areas by State--fiscal year 1979 (thousands of recreation visitor-days[1/])

STATE NAME	ROADS	TRAILS	LAKES/PONDS	RESER-VOIRS	RIVERS/ STREAMS	OCEANS/ GREAT LAKES	GENERAL UNDEVELOPED AREA	TOTAL USE	TOTAL USE DEVELOPED & DISPERSED	[2/] FY 1979 USE (RECREATION DAYS)
ALABAMA	355.4	27.5	4.4	87.2	69.3		338.4	882.2	1,153.9	3,629,888
ALASKA	824.3	135.0	105.0	.6	109.7	1,436.1	239.6	2,350.3	3,236.0	16,968,329
ARIZONA	3,539.4	860.1	7.8	851.2	349.3		2,875.6	8,483.4	13,839.1	43,546,748
ARKANSAS	423.1	68.8		415.3	194.7		923.5	2,025.4	2,782.6	8,694,296
CALIFORNIA	14,141.4	2,272.9	788.8	2,575.6	2,264.9		9,903.5	31,947.1	54,326.3	342,082,757
COLORADO	4,911.2	1,461.1	369.1	602.7	689.9		4,399.0	12,433.0	22,039.4	106,905,398
FLORIDA	270.9	25.1	393.1	13.5	180.4		923.9	1,806.9	3,229.1	8,371,125
GEORGIA	460.6	143.3		128.8	189.7		613.4	1,535.8	1,899.2	5,862,128
IDAHO	2,174.8	569.9	290.6	312.4	803.5		2,863.1	7,014.3	10,540.5	35,389,153
ILLINOIS	88.4	82.5	.5	56.8	17.3		375.7	621.2	829.0	2,943,927
INDIANA	134.7	15.9		193.7	21.6		175.2	541.1	739.6	2,244,109
KANSAS	18.8			1.1			5.0	24.9	30.9	277,436
KENTUCKY	773.7	144.4		444.9	183.2		383.8	1,930.0	2,561.7	9,573,741
LOUISIANA	82.1	38.3		39.2	27.1		145.2	331.9	543.5	1,600,454
MAINE	19.9	6.4	2.4	.9	2.5		13.2	36.3	85.5	280,236
MICHIGAN	1,767.0	191.3	327.4	29.4	269.1		1,110.3	3,685.5	5,015.7	13,751,413
MINNESOTA	527.3	151.6	1,175.6	5.4	187.7		951.5	2,999.1	4,150.3	10,975,512
MISSISSIPPI	843.0	11.0	4.8	64.6	74.9		543.9	942.2	1,227.8	3,512,658
MISSOURI	405.7	46.5	.2	38.8	183.8		436.4	1,111.4	1,456.6	4,073,425
MONTANA	2,976.4	588.8	268.3	192.9	464.8		2,236.4	5,827.6	8,329.6	24,641,239
NEBRASKA	21.0	7.7		9.0	.5		67.5	105.7	151.3	890,027
NEVADA	508.3	73.6	9.5	2.2	54.5		455.4	1,103.5	2,077.9	15,254,431
NEW HAMPSHIRE	880.1	690.1	8.6	3.0	35.5		371.8	1,489.1	2,380.9	9,078,715
NEW MEXICO	996.5	242.6	19.4	125.2	208.7		1,712.3	3,304.7	5,511.1	18,506,113
NEW YORK	.7	3.5		.9			6.6	11.7	20.7	57,901
NORTH CAROLINA	1,111.8	291.7	9.5	159.1	395.2		1,285.5	3,252.8	4,490.6	17,521,440
NORTH DAKOTA	24.6			7.7	5.2		70.2	107.7	120.6	393,313
OHIO	79.4	7.8		16.8	20.8		182.9	307.7	361.8	1,097,994
OKLAHOMA	176.0	5.9		23.5	12.2		98.8	315.4	392.8	1,818,494
OREGON	3,428.1	677.1	584.5	458.6	884.0		3,983.9	10,016.2	18,016.8	47,519,889
PENNSYLVANIA	436.2	53.0		123.1	110.5		708.9	1,431.7	2,051.9	5,950,853
SOUTH CAROLINA	884.4	25.6	.3	63.1	113.4		295.1	761.9	986.2	3,206,886
SOUTH DAKOTA	1,208.9	18.3		92.9	33.2		271.9	1,617.2	2,211.1	17,247,366
TENNESSEE	368.6	138.5		98.8	157.6		405.1	1,168.6	2,029.6	6,075,789
TEXAS	218.0	13.0	.2	934.1	21.1		314.1	1,500.5	1,841.8	4,952,379
UTAH	2,658.4	546.8	244.6	671.4	473.6		3,266.1	7,860.9	12,501.1	40,478,150
VERMONT	52.3	26.3	2.1	.9	4.9		63.3	149.8	558.8	1,726,252
VIRGINIA	971.6	202.7		102.1	221.3		1,161.9	2,659.6	3,292.5	11,549,996
WASHINGTON	3,057.9	928.0	337.3	93.2	474.1	5.0	3,443.0	8,338.5	13,576.5	35,800,812
WEST VIRGINIA	282.8	61.5	.4	30.8	134.0		430.5	920.0	1,280.9	3,249,413
WISCONSIN	548.9	70.7	217.5	15.0	84.1		459.9	1,390.1	1,881.8	5,166,993
WYOMING	1,192.4	458.0	263.7	111.7	324.3		1,311.9	3,662.0	5,717.0	24,323,780
PUERTO RICO	87.5	45.3			116.2		70.4	299.4	695.6	4,500,680
SERVICE WIDE	50,748.5	11,428.1	5,435.6	9,189.1	10,168.3	1,441.1	49,893.6	138,304.3	220,165.6	921,691,638

1/ One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

2/ The Heritage Conservation and Recreation Service (HCRS) has used the "recreation day" as a common basis for displaying recreation use on Federal lands administered by the seven Federal land managing agencies. A "recreation day" is defined as the presence of one person on an area of land or water for the purpose of engaging in one or more recreation activities during all or part of a calendar day.

Table C 5.--Use of Forest Service dispersed recreation areas by Region--fiscal year 1979 (thousands of recreation visitor-days[1/])

REGION	ROADS	TRAILS	LAKES/PONDS	RESER-VOIRS	RIVERS/ STREAMS	OCEANS/ GREAT LAKES	GENERAL UNDEVELOPED AREA	TOTAL USE	TOTAL USE DEVELOPED & DISPERSED
01	2,908.2	781.9	341.3	269.5	786.6		3,361.1	8,443.6	11,871.9
02	6,934.2	1,625.4	423.3	759.7	925.6		5,533.0	16,198.2	27,689.8
03	4,557.7	1,102.7	27.2	1,016.7	558.0		4,604.6	11,866.9	19,505.8
04	5,487.2	1,404.7	708.5	1,014.8	1,226.4		6,179.1	16,020.7	25,456.1
05	13,670.8	2,187.1	755.8	2,535.6	2,172.7		9,785.0	31,007.0	52,993.6
06	6,521.8	1,603.1	927.5	551.8	1,361.2	5.0	7,418.7	18,389.1	31,627.6
08	5,820.0	1,184.9	412.7	2,543.7	1,958.9		7,566.1	19,486.3	27,177.9
09	4,038.3	1,403.3	1,734.3	496.7	1,069.2		5,206.4	14,542.2	20,606.9
10	824.3	135.0	105.0	.6	109.7	1,436.1	239.6	2,350.3	3,236.0
SERVICEWIDE	50,748.5	11,428.1	5,435.6	9,189.1	10,168.3	1,441.1	49,893.6	138,304.3	220,165.6

1/ One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table C 6.--Use of Forest Service developed recreation sites by State--fiscal year 1979 (thousands of recreation visitor-days[1/])

STATE NAME	OBSERV. SITE	PLAY, PARK, SPORTS	BOATING SITE	SWIMMING SITE	CAMP-GROUNDS	PICNIC GROUNDS	HOTEL, LODGE, RESORTS	ORGANI-ZATION SITES	OTHER CONC. SITES	RECN RES. SITES	WINTER SPORTS SITES	DOC. SITES	INTERP-RETIVE SITES	TOTAL USE	PERCNT OF TOTAL
ALABAMA			5.0	76.5	171.5	12.7							6.0	271.7	.3
ALASKA	54.1	11.7	7.1	13.1	374.9	63.2	17.5	13.0		27.9	157.4		145.8	885.7	1.1
ARIZONA	53.5	56.1	245.0	72.7	3097.9	533.9	283.3	364.3	58.2	432.9	66.1	1.4	90.4	5355.7	6.5
ARKANSAS	32.4		3.0	118.4	410.3	107.4	34.4	17.7		8.5			25.1	757.2	.9
CALIFORNIA	192.0	48.0	410.1	249.3	9544.1	789.0	1519.8	2536.4	225.1	3414.5	3202.7	.8	247.4	22379.2	27.3
COLORADO	82.6	6.6	57.8		3777.9	493.3	263.6	178.0	82.2	281.4	4301.9	20.8	60.3	9606.4	11.7
FLORIDA			47.5	143.0	737.4	267.1		90.1		120.3		2.0	14.8	1422.2	1.7
GEORGIA	21.8		14.6	16.0	211.0	36.0		28.8		16.5			18.7	363.4	.4
IDAHO	8.5	.6	140.4	36.4	1880.0	184.9	164.3	184.9	9.8	290.7	486.8	21.2	117.7	3526.2	4.3
ILLINOIS	28.9		12.8	13.2	102.9	46.1						.2	3.7	207.8	.3
INDIANA	.1		22.6	21.8	128.9	20.9							4.2	198.5	.2
KANSAS						6.0								6.0	
KENTUCKY	62.6	1.5	89.5	11.1	336.7	99.8		15.3		11.2		.5	3.5	631.7	.8
LOUISIANA	1.7		5.1	34.7	112.2	13.0		15.8		23.3			5.8	211.6	.3
MAINE	2.5				16.7	2.3		1.3			26.0		.4	49.2	.1
MICHIGAN	32.8	5.9	151.8	88.3	696.5	135.2	2.6	25.8	.7	77.4	96.6	2.3	14.3	1330.2	1.6
MINNESOTA	2.4		130.9	52.7	563.6	46.5	116.0	37.6	3.3	148.9	46.9	.8	1.6	1151.2	1.4
MISSISSIPPI			23.5	85.8	95.3	31.0		47.6					2.4	285.6	.3
MISSOURI	2.0		15.5	5.8	204.7	85.2		29.2				.3	2.5	345.2	.4
MONTANA	12.8		96.6	33.6	1245.2	143.6	92.8	118.2	1.7	237.6	419.0	1.5	99.4	2502.0	3.1
NEBRASKA	.1			1.4	11.8	18.7		13.5				.1		45.6	.1
NEVADA	2.8	6.7		51.7	413.2	132.5		95.2		22.7	202.8		46.8	974.4	1.2
NEW HAMPSHIRE	41.5		7.7	19.4	403.4	46.2	74.8	2.1			287.2		9.5	891.8	1.1
NEW MEXICO	61.9		74.8		1093.2	313.0	11.4	66.3	19.8	68.8	397.3	7.0	92.9	2206.4	2.7
NEW YORK					7.0	2.0								9.0	
NORTH CAROLINA	90.8		62.9	94.7	619.0	289.6	12.5			7.7		.6	60.0	1237.8	1.5
NORTH DAKOTA					11.8	.8							.3	12.9	
OHIO			1.6	5.5	26.0	20.4							.6	54.1	.1
OKLAHOMA	17.9		5.3	8.8	26.2	14.8							4.4	77.4	.1
OREGON	161.3		437.4	44.6	4126.4	530.3	952.1	387.8	131.8	413.4	667.1	3.3	145.1	8000.6	9.8
PENNSYLVANIA	43.8	.2	28.2	36.1	413.4	15.0		28.6		49.4			5.5	620.2	.8
SOUTH CAROLINA		7.7	11.5	9.7	130.5	56.2		2.6				.3	5.8	224.3	.3
SOUTH DAKOTA	16.5	2.3	24.1	16.8	303.4	41.4	4.2	40.8	22.4	81.6	36.3		4.1	593.9	.7
TENNESSEE	14.4	3.9	16.5	70.4	422.9	153.2	30.2	42.8	2.3	91.2		.3	12.9	861.0	1.1
TEXAS	.3		29.5	26.9	201.6	44.2	15.0		19.6				4.2	341.3	.4
UTAH	43.2	3.6	108.1	45.1	2705.9	289.8	309.0	230.3	27.5	287.3	554.7	.2	35.5	4640.2	5.7
VERMONT	2.1	1.5		13.5	39.4	5.6	9.0	11.0		1.0	324.9		1.0	409.0	.5
VIRGINIA	26.2	3.4	5.0	35.8	387.7	118.0		30.8	.5	.6		1.0	23.9	632.9	.8
WASHINGTON	60.0		84.6	20.6	2483.5	118.2	348.2	451.3	7.9	321.6	1316.9	.5	24.7	5238.0	6.4
WEST VIRGINIA	3.6		11.3	10.4	239.2	30.9		57.1		.7		2.3	5.4	360.9	.4
WISCONSIN			47.3	58.8	337.2	17.6	2.1	1.1	1.1	8.0	12.2		6.3	491.7	.6
WYOMING	20.4		73.0	14.3	974.8	88.7	257.6	136.9	4.4	216.3	236.9	.7	31.0	2055.0	2.5
PUERTO RICO	56.3					132.0		65.3	29.5	4.0			109.1	396.2	.5
SERVICE WIDE	1253.8	159.7	2507.6	1656.9	39085.2	5596.2	4520.4	5367.5	647.8	6665.4	12839.7	68.1	1493.0	81861.3	100.0

1/ One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table C 7.--Use of Forest Service developed recreation sites by Region--fiscal year 1979 (thousands of recreation visitor-days[1/])

REGION		OBSERV. SITE	PLAY, PARK, SPORTS	BOATING SITE	SWIMMING SITE	CAMP-GROUNDS	PICNIC GROUNDS	HOTEL, LODGE, RESORTS	ORGANI-ZATION SITES	OTHER CONC. SITES	RECN RES. SITES	WINTER SPORTS SITES	DOC. SITES	INTERP-RETIVE SITES	TOTAL USE	PERCNT OF TOTAL	
01	USE	14.2		121.5	55.2	1827.1	237.3	116.9	120.2	7.6	295.2	459.7	9.4	164.0	3428.3		
	%	1.1		4.8	3.3	4.7	4.2	2.6	2.2	1.2	4.4	3.6	13.8	11.0	4.2	28.9	
02	USE	115.3	8.9	96.3	18.2	4706.9	634.2	494.8	293.3	108.3	534.7	4376.7	21.6	82.4	11491.6		
	%	9.2	5.6	3.8	1.1	12.0	11.3	10.9	5.5	16.7	8.0	34.1	31.7	5.5	14.0	41.5	
03	USE	115.4	56.1	338.3	72.7	4195.7	886.6	308.7	430.6	78.0	501.7	463.4	8.4	183.3	7638.9		
	%	9.2	35.1	13.5	4.4	10.7	15.8	6.8	8.0	12.0	7.5	3.6	12.3	12.3	9.3	39.2	
04	USE	57.4	10.9	282.2	74.2	5200.0	534.9	597.2	584.3	38.6	616.3	1277.2	13.5	148.7	9435.4		
	%	4.6	6.8	11.3	4.5	13.3	9.6	13.2	10.9	6.0	9.2	9.9	19.8	10.0	11.5	37.1	
05	USE	190.1	48.0	410.1	301.0	9136.1	782.3	1402.4	2536.4	218.6	3385.9	3327.5	.8	247.4	21986.6		
	%	15.2	30.1	16.4	18.2	23.4	14.0	31.0	47.3	33.7	50.8	25.9	1.2	16.6	26.9	41.5	
06	USE	223.2		522.0	65.2	6607.9	648.5	1300.3	839.1	139.7	735.0	1984.0	3.8	169.8	13238.5		
	%	17.8		20.8	3.9	16.9	11.6	28.8	15.6	21.6	11.0	15.5	5.6	11.4	16.2	41.9	
08	USE	324.4	16.5	300.6	736.2	3901.0	1340.0	78.1	357.4	51.9	284.0		4.7	296.8	7691.6		
	%	25.9	10.3	12.0	44.4	10.0	23.9	1.7	6.7	8.0	4.3		6.9	19.9	9.4	28.3	
09	USE	159.7	7.6	429.5	321.1	3135.6	469.2	204.5	193.2	5.1	284.7	793.8	5.9	54.8	6064.7		
	%	12.7	4.8	17.1	19.4	8.0	8.4	4.5	3.6	.8	4.3	6.2	8.7	3.7	7.4	29.4	
10	USE	54.1	11.7	7.1	13.1	374.9	63.2	17.5	13.0		27.9	157.4		145.8	885.7		
	%	4.3	7.3	.3	.8	1.0	1.1	.4	.2		.4	1.2		9.8	1.1	27.4	
SERVICE WIDE	USE	1253.8	159.7	8507.6	1656.9	39085.2	5596.2	4520.4	5367.5	647.8	6665.4	12839.7	68.1	1493.0	81861.3		
	%	.6	.1	1.1	.8	17.8	2.5	2.1	2.4	.3	3.0	5.8		.7	37.2		

1/ One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table C 8.--Reforestation needs in acres as of October 1, 1979, by State, Forest, and site productivity class

State	National Forest		Acres by site productivity class 20-49	50-84	85-119	120+	Total acres
Alabama	Alabama	Total		1,365	2,730	455	4,550
Alaska	Tongass-Stikine					15,731	15,731
	Tongass-Chatham				3,138	9,751	12,889
	Chugach		40	178			218
	Tongass-Ketchikan					17,413	17,413
		Total	40	178	3,138	42,895	46,251
Arizona	Apache-Sitgreaves		5,920	9,026	1,187		16,133
	Coconino		8,507	16,970			25,477
	Coronado			17	18		35
	Kaibab		3,710	7,821			11,531
	Prescott			835			835
	Tonto		89	437			526
		Total	18,226	35,106	1,205		54,537
Arkansas	Ozark-St. Francis			8,500	2,833		11,333
	Ouachita			18,647	4,113		22,760
		Total		27,147	6,946		34,093
California	Angeles			603			603
	Cleveland			82			82
	Eldorado			718	1,111	127	1,956
	Inyo		574				574
	Klamath		10,401	8,224	5,031	2,040	25,696
	Lassen		145	1,180	454	6	1,785
	Los Padres		217	223	20		460
	Mendocino		473	2,069	419	30	2,991
	Modoc		260	12,164	2,271	578	15,273
	Plumas		199	4,308	4,982	1,450	10,939
	Rogue River			1,500	3,164		4,664
	San Bernardino		737	50	165		952
	Sequoia		522	3,722	3,374		7,618
	Shasta-Trinity		1,712	38,048	19,641	11,051	70,452
	Sierra		46	1,807	1,853	849	4,555
	Siskiyou			202	584	96	5,546
	Six Rivers			81	2,293	6,349	8,723
	Stanislaus			991	6,416	2,839	10,246
	Tahoe		589	4,973	4,240	2,705	12,507
	Toiyabe		1,448				1,448
		Total	17,323	80,945	56,018	28,120	182,406

Table C 8.--Reforestation needs in acres as of October 1, 1979, by State, Forest, and site productivity class (con.)

State	National Forest		Acres by site productivity class 20-49	50-84	85-119	120+	Total acres
Colorado	Arapaho and Roosevelt		9,451				9,451
	Grand Mesa, Uncompahgre and Gunnison		32,154	17,415	19,798		69,427
	Manti-LaSal			500			500
	Pike and San Isabel		30	70			100
	Rio Grande		6,650	2,850			9,500
	Routt		3,078				3,078
	San Juan		1,776	19,180	9,729		30,685
	White River			859	800		1,659
		Total	43,688	50,385	30,327		124,400
Florida	Florida	Total	8,627	8,980	5,642	743	23,992
Georgia	Chattahoochee-Oconee	Total	65	5,036	4,819	726	10,646
Idaho	Boise		4,289	27,085	3,151		34,525
	Caribou			769			769
	Challis		544	262			806
	Clearwater		65	32,410	22,370	105,042	159,887
	Nezperce		211	14,980	9,202	8,710	33,103
	Idaho Panhandle			3,280	22,439	50,056	75,775
	Payette		700	4,652	1,953		7,305
	Salmon		5,443	4,928	300		10,671
	Sawtooth		290	3,354	144		3,788
	Targhee		13,408	4,402			17,810
		Total	24,950	96,122	59,559	163,808	344,439
Illinois	Shawnee	Total	295	4,315	2,500	710	7,820
Indiana	Hoosier	Total		638	347	225	1,210
Kentucky	Daniel Boone	Total	110	2,387	2,396	4,718	9,611
Louisiana	Kisatchie	Total	321	1,758	4,637	7,300	14,016
Maine	White Mountain	Total					0
Michigan	Hiawatha		441	679	70	7	1,197
	Huron-Manistee		2,600	2,000	789		5,389
	Ottawa			2,560	640		3,200
		Total	3,041	5,239	1,499	7	9,786
Minnesota	Chippewa		695	474			1,169
	Superior		11,185	17,052	8,870	3,740	40,847
		Total	11,880	17,526	8,870	3,740	42,016

Table C 8.--Reforestation needs in acres as of October 1, 1979, by State, Forest, and site productivity class (con.)

State	National Forest		Acres by site productivity class				Total acres
			20-49	50-84	85-119	120+	
Mississippi	Mississippi	Total		2,444	9,586	5,176	17,206
Missouri	Mark Twain	Total	4,875	3,120			7,995
Montana	Beaverhead		886	4,075	1,100		6,061
	Bitterroot		1,107	5,811	3,088		10,006
	Custer		519	352			871
	Deerlodge		2,707	6,252	85		9,044
	Flathead		552	4,091	14,536	6,497	25,676
	Gallatin		5,244	3,926	85		9,255
	Helena		407	9,858	1,081		11,346
	Kootenai		1,165	10,027	50,046	15,588	76,826
	Lewis and Clark		138	3,586			3,724
	Lolo		428	15,516	11,850	886	28,680
		Total	13,153	63,494	81,871	22,971	181,489
Nebraska	Nebraska	Total					0
Nevada	Humbolt						
	Toiyabe						
		Total					0
New Hampshire	White Mountain	Total					0
New Mexico	Carson		2,774	7,313			10,087
	Cibola			12,855	8,129		20,984
	Gila		443	7,481			7,924
	Lincoln		864	4,692			5,556
	Santa Fe			11,279			11,279
		Total	4,081	43,620	8,129		55,830
North Carolina	North Carolina	Total	328	1,371	920	3,460	6,079
Ohio	Wayne	Total		487	393	376	1,256
Oklahoma	Ouachita	Total		1,986	91	402	2,479
Oregon	Deschutes		34,578	9,202	3,320		47,100
	Fremont		5,114	11,420	1,165		17,699
	Malheur		2,274	5,383	162	13	7,832
	Mt. Hood		393	4,124	11,343	3,078	18,938
	Ochoco		677	2,047	678		3,402
	Rogue River			4,957	22,697	465	28,119
	Siskyou		332	9,190	21,261	10,284	41,067
	Siuslaw					10,995	10,995

Table C 8.--Reforestation needs in acres as of October 1, 1979, by State, Forest, and site productivity class (con.)

State	National Forest		Acres by site productivity class 20-49	50-84	85-119	120+	Total acres
	Umatilla		534	13,007	897		14,438
	Umpqua		28	913	14,123	2,865	17,929
	Wallowa-Whitman		4,011	4,418	401		8,830
	Willamette			1,510	17,147	17,891	36,548
	Winema		12,081	12,077	753	208	25,119
		Total	60,022	78,248	93,947	45,799	278,016
Pennsylvania	Allegheny	Total		1,215	3,631	1,215	6,061
Puerto Rico	Caribbean	Total			1,014		1,014
South Carolina	South Carolina	Total		1,785	1,809	1,706	5,300
South Dakota	Black Hills	Total	80				80
Tennessee	Cherokee	Total		750	983	250	1,983
Texas	Texas	Total			14,173		14,173
Utah	Ashley		1,727	610			2,337
	Dixie		237	3,150			3,387
	Fishlake		932				932
	Manti-LaSal			322			322
	Sawtooth						
	Uinta			28	184		212
	Wasatch		532	1,146	249		1,927
		Total	3,428	5,256	433		9,117
Vermont	Green Mountain	Total	3,104	333	258		3,695
Virginia	George Washington			85	275	341	701
	Jefferson			847	852		1,699
		Total		932	1,127	341	2,400
Washington	Colville		164	9,889	6,223	384	16,660
	Gifford Pinchot		1,060	10,927	23,586	4,116	39,689
	Mt. Baker-Snoqualmie		63	2,690	8,720	3,034	14,507
	Okanogan		334	2,012			2,346
	Olympic			387	9,296	9,978	19,661
	Wenatchee		7,567	5,653	5,683	116	19,019
	Umatilla			1,416			1,416
		Total	9,188	32,974	53,508	17,628	113,298
West Virginia	George Washington			20	20		40
	Monongahela				694		694
		Total		20	714		734

Table C 8.--Reforestation needs in acres as of October 1, 1979, by State, Forest, and site productivity class (con.)

State	National Forest	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+	
Wisconsin	Chequamegon	2,328	4,408	382	256	7,374
	Nicolet	139	1,400	450		1,989
	Total	2,467	5,808	832	256	9,363
Wyoming	Bighorn	623	250			873
	Blackhills	75				75
	Bridger-Teton		5,805	500		6,305
	Medicine Bow	3,216				3,216
	Shoshone	200	30			230
	Targhee	38	216			254
	Wasatch	271				271
	Total	4,423	6,301	500		11,224
	Grand total	233,715	587,271	464,552	353,027	1,638,565

Table C 9.--Reforestation program needs by fiscal year to 1985 and beyond (thousands of acres)

	Backlog		Current		Anticipated		Total			M dollars
	K-V	REF	K-V	REF	K-V	REF	K-V	REF	Total	total 3/
10/1/78	76	1,359	392	352	-	-	468	1,711	2,179	
FY 79										
New needs	-	-	+3 2	+127	-	-	+302	+ 127	+429	
Adj	-6	-439	-	- 85	-	-	-6	- 524	-530 2/	3/
Accompl.	-16	-92	-204	-127	-	-	-220	- 219	-439	102,520
10/1/79 BAL	54	828	490	267	-	-	544	1,095	1,639	
FY 80										
New needs	-	-	-	-	+301	+129	+301	+ 129	+ 430	4/
Accompl.	-11	- 96	-208	-125	-	-	-219	- 221	- 440	114,416
10/1/80 BAL	43	732	282	142	301	129	626	1,003	1,629	
FY 81										
New needs	-	-	-	-	+274	+146	+274	+ 146	+ 420	5/
Accompl.	-10	-104	-128	- 38	-107	- 73	-245	- 215	- 460	117,510
10/1/81 BAL	33	628	154	104	468	202	655	934	1,589	
FY 82										
New needs	-	-	-	-	+260	+140	+260	+ 140	+ 400	5/
Accompl.	- 9	-107	- 64	- 34	-190	- 79	-263	- 220	- 483	122,937
10/1/82 BAL	24	521	90	70	538	263	652	854	1,506	
FY 83										
New needs	-	-	-	-	+260	+140	+260	+ 140	+ 400	5/
Accompl.	- 7	- 91	- 36	- 20	-217	-109	-260	- 220	- 480	122,280
10/1/83 BAL	17	430	54	50	581	294	652	774	1,426	
FY 84										
New needs	-	-	-	-	+260	+140	+260	+ 140	+ 400	5/
Accompl.	- 5	- 76	- 30	- 20	-235	-110	-270	- 206	- 476	120,312
10/1/84 BAL	12	354	24	30	606	324	642	708	1,350	
FY 85										
New needs	-	-	-	-	+260	+140	+260	+ 140	+ 400	5/
Accompl.	- 6	- 44	- 11	- 12	-270	-147	-287	- 203	- 490	123,144
10/1/85 BAL	6	310	13	18	596	317	615	645	1,260	

An estimated total of 882,000 acres is pre July 1, 1975.

1/ Includes accomplishments from all sources.
2/ This adjustment includes 260 M acres regenerated through natural stocking and 270 acres reduction by management decision (land classification, multiple use, land use decisions).
3/ Actual average cost of $220 per acre reforestation funds and $247 per acre KV.
4/ Actual average cost of $268 per acre reforestation funds and $252 per acre KV.
5/ Average cost for Fiscal Year 1981 program of $297 per acre reforestation funds and $219 per acre KV.

Table C 10.--Reforestation status of backlog and current acres by Region

	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	R-10	Total
BACKLOG										
Backlog as of 10/1/78	443,759	308,588	100,040	90,214	124,378	250,822	40,050	70,501	6,880	1,435,232
1. Backlog reported 10/1/78	443,759	308,588	100,040	90,214	124,378	250,822	40,050	70,501	6,880	
2. Refor. treatments FY 1979										
a. Appr. fund refor.—acres	31,567	10,490	7,619	-6,732	9,415	-15,958	6,115	1,347	100	
b. KV fund refor.--acres	1,710	1,295	1,091	-2,026	2,370	-5,753	2,046	206		
c. Other fund refor.—acres			42	-24				2,253		
d. Total	-33,277	-11,785	-8,752	-8,782	-11,785	-21,711	-8,161	-3,806	100	108,159
3. Changes due to:										
a. Stocking--acres	-35,672	-89,091	+11,946	-11,775	-23,518	-65,445	-7,346	-5,759	-470	(227,130)
b. Land class--acres	-23,031	-15,103	-7,111		+4,751	-26,301	-10,780	-7,382		
c. Multiple use--acres	-2,944	-13,173	-8,258	-2,820	-4,431	-723	-1,450	-1,315		
d. Other—acres	-19,077	-65,247	1,215	-2,378		+11,809	-1,457	-12,625	-663	
e. Total changes--acres	80,724	-182,614	-2,208	-16,973	32,700	-80,660	-21,033	-27,081	-1,133	445,126
acres										
4. Remaining backlog - (1-2d-3e)	329,758	114,189	89,080	64,459	79,893	148,451	10,856	39,614	5,647	881,947
5. Not feasible to refor. by '85.	104,895	76,274	11,728	30,574	19,297	59,375		11,625	2,104	315,872
6. Acres to reforest (4-5)	224,863	37,915	77,352	33,885	60,596	89,076	10,856	27,989	3,543	566,075
CURRENT										
Current refor.—as of 10/1/78	146,528	13,992	19,826	29,647	85,739	185,473	167,902	56,242	38,209	743,558
1. Current refor.--as of 10/1/78										
2. Refor. Treatments in FY 79	-23,886	-6,143	-10,033	-16,425	-23,681	-97,820	-102,111	-50,835	-308	-331,242
3. Changes due to: acres										
a. Regen. harvest additions +	32,364	7,998	4,894	14,665	16,416	117,968	79,171	44,109	23,280	
b. Fire additions +	338	230	674	1,470	1,328	3,404	1,329	26		
c. I&D 1/ additions +		460	89	45	120	462	1,475	275		
d. Refor. failures +	3,653	2,202	5,617	2,800	7,163	36,861	12,329	5,870		
e. Stocking changes + or -	-21,653	-4,554		-1,029	8,537	-6,559	-3,582	9,958	-14,458	
f. Land class changes + or -	-10,131			-170		-148	284			
g. Multiple use needs -	-6,374			-429	-103	-615	874			
h. Other	-343		220	-1,464		9,383	-20,945	-15,363	-6,119	
i. Total changes (Net)	(-2,146)	(+6,336	(11,494)	(+15,888)	(33,461)	(160,756)	(70,935)	(44,875)	(2,703)	+344,302
4. Current refor.--10/1/79 (1-2+3i)	120,496	14,185	21,287	29,110	95,519	248,409	136,726	50,282	40,604	756,618

1/ I&D stands for insect and disease

Table C 11.-- Timber stand improvement needs in acres as of October 1, 1979 by State, Forest and site productivity class

State	National Forest	Acres by site productivity class				Total acres	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+		20-49	50-84	85-119	120+	
		Release					Thinning				
Alabama	Alabama			770		770		118	2,250		2,368
	Tongass-Stikine								4,718		4,718
	Tongass-Chatham			1,215		1,215			2,247		2,247
	Chugach		50	50		100		673	686		1,359
	Tongass-Ketchikan				2,316	2,316				24,747	24,747
			50	1,265	2,316	3,631		673	7,651	24,747	33,071
Arizona	Apache-Sitgreaves						16,008	109,077	4,101		129,186
	Coconino						17,731	50,624			68,355
	Coronado		634	300		934		1,096	136		1,232
	Kaibab						4,742	50,862			55,604
	Prescott		70			70		1,840			1,840
	Tonto						4,390	11,207			15,597
			704	300		1,004	42,871	224,706	4,237		271,814
Arkansas	Ozark-St. Francis		5,379	1,793		7,172		8,069	2,690		10,759
	Ouachita		5,455	261		5,716		9,092	1,249		10,341
			10,834	2,054		12,888		17,161	3,939		21,100
California	Angeles							230			230
	Cleveland		285			285		4,326			4,326
	Eldorado		1,054	3,309	58	4,421		60	249	73	382
	Inyo	83				83	402	320			722
	Klamath	127	6,185	5,807	1,734	13,853	24	9,455	10,773	839	21,091
	Lassen	26	1,137	4,856	827	6,846	361	1,911	1,051	256	3,579
	Los Padres	220	382	50		652		801	10		811
	Mendocino	338	939	901	189	2,367	284	1,450	516	80	2,330
	Modoc		455	1,000		1,455	1,126	13,637	3,617		18,380
	Plumas	2,408	11,374	8,036	7,174	28,992	49	7,946	4,626	2,151	14,772
	Rogue River			1,663		1,663		57			57
	San Bernardino	116	202	30		348	4,764	1,301	210		6,275
	Sequoia		374	2,381	50	2,805	30	682	1,106	360	2,178
	Shasta-Trinity	840	3,511	3,626	4,924	12,901		7,710	3,432	2,867	14,009
	Sierra		227	637	566	1,430		1,776	2,354	2,293	6,423
	Siskiyou		52	244	256	552		57	108		165
	Six Rivers		22	5,899	16,439	22,360			1,666	6,990	8,656
	Stanislaus		446	2,520	1,207	4,173		150	1,000	758	1,908
	Tahoe	636	6,766	6,449	3,609	17,460	303	5,686	2,190	1,036	9,215
	Toiyabe	2,398				2,398	7,201				7,201
		7,192	33,411	47,408	37,033	125,044	14,544	57,555	32,908	17,703	122,710

Table C 11.--Timber stand improvement needs in acres as of October 1, 1979 by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class				Total acres	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+		20-49	50-84	85-119	120+	
		Release					Thinning				
Colorado	Arapaho and Roosevelt							127,932			127,932
	Grand Mesa, Uncompahgre and Gunnison		1,250	420		1,670		3,762	1,254		5,016
	Manti-LaSal		2,155			2,155		507			507
	Pike and San Isabel						7,000	13,000			20,000
	Rio Grande	2,231	13,656	2,417		18,304	1,825	11,173	1,978		14,976
	Routt	825				825	2,100				2,100
	San Juan		1,664			1,664	2,622	4,594			7,216
	White River						3,470	3,593	827		7,890
		3,056	18,725	2,837		24,618	17,017	164,561	4,059		185,637
Florida	Florida		1,727			1,727					
Georgia	Chattahoochee-Oconee		1,479	1,426	991	3,896		167	134		301
Idaho	Boise						237	4,599	3,398	1,522	9,756
	Caribou							594			594
	Challis						1,300	610			1,910
	Clearwater		15	1,237	8,602	9,854	55	10,553	14,919	15,274	40,801
	Nezperce		357		397	754		5,614	80	644	6,338
	Idaho Panhandle		748	458	4,460	5,666	194	1,972	14,788	50,083	67,037
	Payette						214	2,515	3,786		6,515
	Salmon	202	198			400	4,884	5,195	3		10,082
	Sawtooth		10			10	552				522
	Targhee	1,939	783			2,722	2,141	1,021			3,162
		2,141	2,111	1,695	13,459	19,406	9,547	32,673	36,974	67,523	146,717
Illinois	Shawnee	1,615	1,650	401	270	3,936	1,280	1,315	326	210	3,131
Indiana	Hoosier		390	88	67	545		690	460	290	1,440
Kentucky	Daniel Boone	178	3,463	1,399	4,260	9,300	384	7,882	5,386	5,215	18,867
Louisiana	Kisatchie	119	114	828	993	2,054		45	312	808	1,165
Maine	White Mountain		165	132	32	329		39	31	8	78
Michigan	Hiawatha	894	564	110		1,568	1,063	671	131		1,865
	Huron-Manistee		8,000	2,388		10,388			1,013		1,013
	Ottawa		920	230		1,150		7,800	1,990		9,790
		894	9,484	2,728		13,106	1,063	8,471	3,134		12,668
Minnesota	Chippewa	10,284	6,303			16,581		371			371
	Superior	4,400	17,156	2,450	500	24,506	190	1,057	580	100	1,927
		14,684	23,459	2,450	500	41,093	190	1,428	580	100	2,298
Mississippi	Mississippi		2,587	2,321	3,032	7,940		62	768	1,401	2,231
Missouri	Mark Twain	10,002	6,361			16,363	3,738	4,342			8,080

Table C 11.--Timber stand improvement needs in acres as of October 1, 1979 by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class 20-49	50-84	85-119	120+	Total acres	Acres by site productivity class 20-49	50-84	85-119	120+	Total acres
		Release					Thinning				
Montana	Beaverhead						29	960	688		1,677
	Bitterroot							6	4		10
	Custer		160			160	3,012	1,639			4,651
	Deerlodge	210				210	332	18,815	25		19,172
	Flathead			252		252	179	18,346	29,632	18,484	66,641
	Gallatin	136	261	135		532	5,964	11,449	3,425		20,835
	Helena		322			322	2,576	8,454	2,148		13,178
	Kootenai		14	617	1,879	2,510	138	18,729	49,262	8,704	76,833
	Lewis and Clark		16			16	164	10,438			10,602
	Lolo		78			78	10,206	6,460	8,719	1,393	26,778
		346	851	1,004	1,879	4,080	22,600	95,296	93,903	28,581	240,380
Nebraska	Nebraska										
Nevada	Humboldt	930				930					
	Toiyabe	1,000				1,000					
		1,930				1,930					
New Hampshire	White Mountain		1,480	1,184	297	2,961		352	281	70	703
New Mexico	Carson		192			192	13,265	15,101			28,366
	Cibola							34,807	3,435		38,242
	Gila						19,746	67,764			87,510
	Lincoln						990	5,724			6,714
	Santa Fe		1,000			1,000		53,599			53,599
			1,192			1,192	34,001	176,995	3,435		214,431
North Carolina	North Carolina		1,456	961	1,915	4,332		714	217	1,115	2,046
Ohio	Wayne		470	68	147	685		652	380	274	1,306
Oklahoma	Ouchtia		1,628			1,628		2,727			2,727
Oregon	Deschutes	310	1,541	892		2,743	9,909	6,226	1,743		17,878
	Fremont		569	35		604	638	14,165	3,160		17,963
	Malheur	581	281			862	23,324	12,632			35,956
	Mt. Hood		461	2,401	65	2,927	372	1,535	5,086	3,010	10,003
	Ochoco						2,916	1,078	250		4,244
	Rogue River		67	13,520	218	13,805			3,754	7	3,761
	Siskiyou		1,428	12,186	6,625	20,239		455	2,155	1,494	4,104
	Siuslaw				6,447	6,447				7,274	7,274
	Umatilla						2,310	4,912	3,170		10,392
	Umpqua		1,251	4,796	1,252	7,299		5,039	3,868	961	9,868
	Wallowa-Whitman	500	993			1,493	7,134	4,555	632		12,321
	Willamette		419	4,812	11,137	16,368		68	1,942	18,305	20,315
	Winema						4,054	22,424	5,839	249	32,566
		1,391	7,010	38,642	25,744	72,787	50,657	73,089	31,599	31,300	186,645

Table C 11.--Timber stand improvement needs in acres as of October 1, 1979 by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class 20-49	50-84	85-119	120+	Total acres	Acres by site productivity class 20-49	50-84	85-119	120+	Total acres
		Release					Thinning				
Pennsylvania	Allegheny							455	1,366	455	2,276
Puerto Rico	Caribbean		2,505			2,505					
South Carolina	South Carolina		426	525	517	1,468		487	1,157	667	2,511
South Dakota	Black Hills						23,986				23,986
Tennessee	Cherokee		492	540	463	1,495		1,426	326	325	2,077
Tennessee	Texas			1,465		1,465			2,099		2,099
Utah	Ashley	295	25			320	8,974	4,292			13,266
	Dixie						300	7,663			7,963
	Fishlake	478	100			578	88	60	20		168
	Manti-LaSal		6,089			6,089		2,857			2,857
	Sawtooth										
	Uinta								107		107
	Wasatch	5,267				5,267	5,896	537	38		6,471
		6,040	6,214			12,254	15,258	15,409	165		30,832
Vermont	Green Mtn.	8,042	704	1,307		10,053	9,714	971	1,458		12,143
Virginia	George Washington	141	416	83	468	1,108	393	181	155	143	872
	Jefferson		318	307	318	943		136	1,143		1,279
		141	734	390	786	2,051	393	317	1,298	143	2,151
Washington	Colville	163	289			452	2,688	3,806			6,494
	Gifford Pinchot	146	2,771	1,838	1,150	5,905	6,939	9,450	19,835	4,961	41,185
	Mt. Baker-Snoqualmie			947	1,596	2,543		410	6,097	2,280	8,767
	Okanogan						1,569	8,164	1,200		10,933
	Olympic				501	501	156	8,266	7,305	6,538	22,265
	Wenatchee		922	147	773	1,842	1,536	12,408	2,671	2,188	18,803
	Umatilla						85	2,625			2,710
		309	3,982	2,932	4,020	11,243	12,973	45,129	37,108	15,967	111,177
W. Virginia	George Washington	8		96	206	310			86	73	159
	Monongahela								20,680		20,680
		8		96	206	310			20,766	73	20,839
Wisconsin	Chequamegon	370	1,700	350	220	2,640	120	250	220	40	630
	Nicolet		1,191	650		1,841		240	140		380
		370	2,891	1,000	220	4,481	120	490	360	40	1,010
Wyoming	Bighorn	31,168	1,565			32,733	9,534				9,534
	Blackhills						1,000				1,000
	Bridger-Teton							5,953	900		6,853

Table C 11.--Timber stand improvement needs in acres as of October 1, 1979 by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class 20-49	50-84	84-119	120+	Total acres	Acres by site productivity class 20-49	50-84	85-119	120+	Total acres
		Release					Thinning				
Wyoming (con.)											
	Medicine Bow	841				841	8,280				8,280
	Shoshone	2,950	213			3,163	6,636	2,080			8,716
	Targhee							367			367
	Wasatch	686				686	667				667
		35,645	1,778			37,423	26,117	8,400	900		35,417
	Grand Total	94,103	150,527	118,216	99,147	461,993	286,453	944,797	299,967	197,215	1,728,432
										Total All	2,190,425

Table C 12.--Timber stand improvement (TSI) needs for fiscal years 1980-1985 and beyond as of October 1, 1979

Needs and funds	Units of measure	FISCAL YEAR 1980	1981	1982	1983	1984	1985	Beyond	Total acres	Total M dollars
Existing										
Appropriated										
	Acres	260,331	263,539	244,037	216,478	206,356	206,705	255,306	1,652,752	
	M $	33,112	35,533	35,732	30,710	30,128	39,712	39,511		244,438
K-V										
	Acres	151,691	99,784	83,949	74,749	57,995	52,551	16,954	537,673	
	M $	15,982	13,087	10,961	8,730	6,518	4,956	4,187		64,421
Total	Acres	412,022	363,323	327,986	291,227	264,351	259,256	272,260	2,190,425	
	M $	49,094	48,620	46,693	39,440	36,646	44,668	43,698		308,859
Expected										
Appropriated										
	Acres	14,760	68,357	86,479	102,884	118,758	98,578	57,935	547,751	
	M $	1,864	8,525	11,170	13,533	17,471	16,770	11,997		81,330
K-V										
	Acres	19,996	60,633	68,346	84,902	88,816	77,731	60,767	461,191	
	M $	2,532	8,363	10,133	13,093	14,452	13,755	9,803		72,131
Total	Acres	34,756	128,990	154,825	187,786	207,574	176,309	118,702	1,008,942	
	M $	4,396	16,888	21,303	26,626	31,923	30,525	21,800		153,461
Total All TSI										
Appropriated	Acres	275,091	331,896	330,516	319,362	325,114	305,283	313,241	2,200,503	
	M $	34,976	44,058	46,902	44,243	47,599	56,482	51,508		325,768
K-V	Acres	171,687	160,417	152,295	159,651	146,811	130,282	77,721	998,864	
	M $	18,514	21,450	21,094	21,823	20,970	18,711	13,990		13,552
Total	Acres	446,778	492,313	482,811	479,013	471,925	435,565	390,962	3,199,367	
	M $	53,490	65,508	67,996	66,066	68,569	75,193	65,498		462,320

States

Table C 13.--Timber stand improvement in acres by Region

	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	R-10	Total
RELEASE										
Needs as of 10/1/78	33,584	48,675	2,196	25,337	121,611	101,321	57,981	123,166	3,175	517,046
1. Needs reported as of 10/1/78	"	"	"	"	"	"	"	"	"	"
2. Treatments in FY 79	3,711	4,392		3,308	11,748	22,612	37,086	32,316	2,299	117,472
3. Changes due to:										
a. Silvic. exam.	7,564	+14,917		2,420	11,762	6,621	34,870	9,508	2,755	90,417
b. Land class	-216				-919	-50	73			-1,112
c. M.U. need	-174				-275	-114	-940			-1,503
d. Other	-711			-2,594		1,079	-1,069	-6,806		-10,101
e. Total	6,463	+14,917		-174	10,568	7,536	32,934	2,702	2,755	77,701
4. Needs as of 10/1/79 (1-2-3)	36,336	59,200	2,196	21,855	120,431	86,245	53,829	93,552	3,631	477,275
THINNING										
Needs as of 10/1/78	402,277	305,863	559,571	103,563	133,709	384,165	72,013	122,589	11,033	2,094,783
1. Needs reported as of 10/1/78	"	"	"	"	"	"	"	"	"	"
2. Treatments in FY 79	-28,148	33,178	99,745	17,891	23,296	75,376	25,227	19,289	2,880	325,030
3. Changes due to:										
a. Silvic. exam.	10,665	-36,039	25,071	956	5,074	46,183	15,435	14,583	24,918	106,846
b. Land class	-30,845		-965	65	-200	-524				-32,469
c. M.U. need	-15,101		-969	-2,075		-1,564	-155			-19,864
d. Other	-274		3,282	-4,950		-54,840	-2,264	-52,070		-111,116
e. Total	-35,555	-36,039	26,419	-6,004	4,874	-10,745	13,016	-37,487	24,918	-56,603
4. Needs as of 10/1/79 (1-2-3)	338,574	236,646	486,245	79,668	115,287	298,044	59,802	65,813	33,071	1,713,151
Total TSI needs										
as of 10/1/78:	435,861	354,538	561,767	128,900	255,320	485,486	129,994	245,755	14,208	2,611,829
as of 10/1/79:	374,910	295,846	488,441	101,523	235,718	384,282	113,631	159,365	36,702	2,190,425

Table C 14.--Certification of reforestation and timber stand improvement acreages by State and Forest

State	National Forest	Plant and seed	Natural Regeneration w/site prep.	Natural Regeneration w/o site prep.	Total refor.	Release	Pre-commercial thinning	Fert.	Total TSI
Alabama	Alabama	22,441	204		2,645	1,018	384		1,402
Alaska	Tongass-Stikine			4,394	4,394		1,310		1,310
	Tongass-Chatham			3,130	3,130		58		58
	Chugach	100		656	756	572	100		672
	Tongass-Ketchikan			8,406	8,406	2,184	962		3,146
		100		16,586	16,686	2,756	2,430		5,186
Arizona	Apache-Sitgreaves						22,489		22,489
	Coconino						30,401		30,401
	Coronado	1,300			1,300		80		80
	Kaibab	673			673		9,487		9,487
	Prescott						861		861
	Tonto						1,914		1,914
		1,973			1,973		65,232		65,232
Arkansas	Ozark-St. Francis	4,930	2,415		7,345	8,141	3,362		11,503
	Ouachita	7,413	3,240	42	10,695	3,188	3,094		6,282
		12,343	5,655	42	18,040	11,329	6,456		17,785
California	Angeles								
	Cleveland					70	351		421
	Eldorado					491	73		564
	Inyo						866		866
	Klamath					716	2,112		2,828
	Lassen					390	862		1,252
	Los Padres								
	Mendocino					260	571		831
	Modoc						2,138		2,138
	Plumas					521	1,921		2,442
	Rogue River								
	San Bernardino					622	492		1,114
	Sequoia						45		45
	Shasta-Trinity					3,823	527		4,350
	Sierra					700	125		825
	Siskiyou	75		75					
	Six Rivers					310	245		555
	Stanislaus					1,619	1,568		3,187
	Tahoe					898	20		918
	Toiyabe								
		75		75	10,420	11,916			22,336

Table C 14.--Certification of reforestation and timber stand improvement acreages by State and Forest (con.)

State	National Forest	Plant and seed	Natural Regeneration w/site prep.	Natural Regeneration w/o site prep.	Total refor.	Release	Pre-commercial thinning	Fert.	Total TSI
Colorado	Arapaho & Roosevelt	800			800		1,050		1,050
	Grand Mesa, Uncompahgre and Gunnison								
	Manti-LaSal					695	179		874
	Pike & San Isabel	425			425		1,036		1,036
	Rio Grande								
	Routt	201	302		503	1,727	1,217		2,944
	San Juan	702			702	393	1,357		1,750
	White River	300		4,511	4,811		777		777
		2,428	302	4,411	7,241	2,815	5,616		8,431
Florida	Florida	8,033			8,033				
Georgia	Chattahooche-Oconee	3,946	2,669		6,615	3,678	2,506		6,184
Idaho	Boise	1,020		1,631	2,651		1,869		1,869
	Caribou			86	86				
	Challis						244		244
	Clearwater	144	29		173	51	680		731
	Nezperce	555		1,002	1,557		342		342
	Idaho Panhandle	3,097	133	228	3,458	214	2,661		2,875
	Payette	1,435	190		1,625		1,157		1,15
	Salmon	99			99		1,336		1,33
	Sawtooth	563	147	15	725	65	292		357
	Targhee	2,164	1,415	1,864	5,443	942	1,139		2,081
		9,077	1,914	4,826	15,817	1,272	9,720		10,992
Illinois	Shawnee	1,000	200		1,200	824	634		1,458
Indiana	Hoosier								
Kentucky	Daniel Boone	2,820	2,592		5,412	5,455	1,428		6,883
Louisiana	Kisatchie	2,913	2,179	698	5,790	1,017	1,334		2,351
Maine	White Mountain								
Michigan	Hiawatha	1,389	2,400	2,600	6,389	1,300	2,150		3,450
	Huron-Manistee	1,626	2,956	4,045	8,627	1,985	202		2,187
	Ottawa								
		3,015	5,356	6,645	15,016	3,285	2,352		5,637
Minnesota	Chippewa								
	Superior	4,000		3,000	7,000	3,000			3,000
		4,000		3,000	7,000	3,000			3,000
Mississippi	Mississippi	6,957	1,830	107	8,894	2,357	1,768		4,125
Missouri	Mark Twain	2,062	2,746	915	5,723	6,055	2,632		8,687

Table C 14.--Certification of reforestation and timber stand improvement acreages by State and Forest (con.)

State	National Forest	Plant and seed	Natural Regeneration w/site prep.	Natural Regeneration w/o site prep.	Total refor.	Release	Pre-commercial thinning	Fert.	Total TSI
Pennsylvania	Allegheny		2,124	275	2,399		1,543		1,543
Puerto Rico	Caribbean	208			208	603			603
South Carolina	South Carolina	4,150	1,822		5,972	1,688	1,327		3,015
South Dakota	Black Hills	340			340		15,329		15,329
Tennessee	Cherokee	2,463	1,213		3,676	1,322	2,763		4,085
Texas	Texas	4,179	511	216	4,906	990	1,096		2,086
Utah	Ashley					51	885		93
	Dixie	160		652	812	40	4,328		4,368
	Fishlake					146	118		264
	Manti-LaSal					125	1,085		1,210
	Sawtooth								
	Uinta		50		50		50		50
	Wasatch	64	232	9	305		246		246
		224	282	661	1,167	362	6,712		7,074
Vermont	Green Mountain		1,106	42	1,148	1,242	251		1,493
Virginia	George Washington	108	16		124	22	1,252		1,274
	Jefferson	707	1,836		2,543	760	1,712		2,472
		815	1,852		2,667	782	2,964		3,746
Washington	Colville	987	78	9,826	10,891		2,045		2,045
	Gifford Pinchot	10,809	593	1,086	12,488	572	4,012		4,584
	Mt. Baker-Snoqualmie	8,310	218	612	9,140	218	2,768		2,986
	Okanogan	150			150		6,727		6,727
	Olympic	8,895	87	794	9,776		6,942	8	6,950
	Wenatchee	5,087	18	254	5,359	67	1,695		1,762
	Umatilla	195			195		140		140
		34,433	944	12,572	47,999	857	24,329	8	25,194
West Virginia	George Washington	191	994		1,135				
	Monongahela	155	164		319	1,297	5,335		6,632
		346	1,108		1,454	1,297	5,335		6,632
Wisconsin	Chequamegon	978	2,287	1,202	4,467	978	960		1,938
	Nicolet	1,142	3,166		4,308	2,156	403		2,559
		2,120	5,453	1,202	8,775	3,134	1,363		4,497
Wyoming	Bighorn	201	1,105		1,306	1,634	707		2,341
	Blackhills	20			20		1,565		1,565
	Bridger-Teton	2,579		233	2,812		606		606

Table C 14.--Certification of reforestation and timber stand improvement acreages by State and Forest (con.)

State	National Forest	Plant and seed	Natural Regeneration w/site prep.	Natural Regeneration w/o site prep.	Total refor.	Release	Pre-commercial thinning	Fert.	Total TSI
Montana	Beaverhead		3,633		3,633		50		5
	Bitterroot	102	8	100	210				
	Custer	507		82	589				
	Deerlodge	273	335	226	834		107		10
	Flathead	2,019	334		2,353				
	Gallatin	50			50		40		4
	Helena	133	152	131	416	230	1,017		1,24
	Kootenai	17,157	571	375	18,103		2,741		2,74
	Lewis and Clark	262	931	1,136	2,329		480		48
	Lolo	868		1,197	2,065		119		11
		21,371	5,964	2,247	30,582	230	4,554		4,78
Nebraska	Nebraska								
Nevada	Humbolt								
	Toiyabe								
New Hampshire	White Mountain								
	Carson						5,584		5,58
	Cibola						4,906		4,90
	Gila	196			196		6,999		6,99
	Lincoln						1,668		1,66
	Santa Fe	372			372		15,356		15,35
		568			568		34,513		34,51
North Carolina	North Carolina	2,313	1,889	89	4,291	3,286	1,587		4,87
Ohio	Wayne								
Oklahoma	Ouachita	1,707	242		1,949	703	513		1,21
Oregon	Deschutes	2,473	1,909		4,382		3,727		3,72
	Fremont	1,067	90	330	1,487	1,314	5,187		6,50
	Malheur								
	Mt. Hood	6,343	220	221	6,784		1,879		1,87
	Ochoco	29			29		268		26
	Rogue River	7,852	1,931	572	10,355	1,298	642		1,94
	Siskyou	3,655		64	3,719	2,161	1,230		3,39
	Siuslaw	8,211		104	8,315	5,968	7,283		13,25
	Umatilla			16	16	700	968		1,66
	Umpaqua	4,333		262	4,595	936	4,110	1,707	6,75
	Wallowa-Whitman								
	Willamette	11,532	764	783	13,079	441	4,041	3,075	7,55
	Winema	3,377		1,578	4,955		5,258		5,25
		48,872	4,914	3,930	57,716	12,818	34,593	4,782	52,19

Table C 14.--Certification of reforestation and timber stand improvement acreages by State and Forest (con.)

State	National Forest	Plant and Seed	Natural Regeneration w/site prep.	Natural Regeneration w/site prep.	Total refor.	Release	Pre-commercial thinning	Fert.	Total TSI
Wyoming (con.)									
	Medicine Bow	40	335	1,776	2,151	120	2,552		2,672
	Shoshone					262	200		46
	Targhee								
	Wasatch						235		235
		2,840	1,440	2,009	6,289	2,016	5,865		7,881
	Grand Total	190,132	56,561	61,573	308,266	86,611	259,045	4,790	350,446

Table C 15.--Certification of reforestation and timber stand improvement acreages by Region

	REGION	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	R-10	Total
Reforestation											
Plant and seed:	acres	25,167	3,029	2,541	8,084		83,380	55,479	12,352	100	190,132
Natural regen:											
w/site prep.	acres	6,126	1,742		2,034		5,908	23,602	17,149		56,561
w/o site prep.	acres	4,477	6,287		4,490		16,502	1,152	12,079	16,586	61,573
Total	acres	35,770	11,058	2,541	14,608		105,790	80,233	41,580	16,686	308,266
TSI											
Release	acres	495	4,136		2,064	10,420	13,675	34,228	18,837	2,756	86,611
Pre-commercial thinning	acres	8,237	25,790	99,745	13,769	11,916	58,922	24,126	14,110	2,430	259,045
Fertilization							4,790				4,790
Total	acres	8,732	29,926	99,745	15,833	22,336	77,387	58,354	32,947	5,186	350,446

Table C 16.--Seed extractory production; fiscal year 1979 (pounds of clean seed)

Region	Location	Seed origin: Seed orchard and selected trees	Seed origin: Seed production areas, seed stands and within seed zones	Seed origin: Other area	Total
1	Coeur d'Alene	433	9,550	-	9,983
2	Bessey	-	264	-	264
	Mt. Sopris	-	2,583	-	2,583
3	Santa Fe	-	655	-	655
4	Lucky Peak	4	2,929	379	3,312
5	Klamath	-	-	-	-
	Placerville	29	12,191	641	12,861
6	Bend	593	14,143	-	14,736
	Wind River	1,691	24,172	-	25,863
8	Ashe	1,286	8,416	-	9,702
	Stuart	351	-	-	351
	Beechcreek	11	-	-	11
9	Various locations	48	416	-	464
10	Petersburg	-	18	-	18
Grand total		4,446	75,337	1,020	80,803

Table C 17.--Forest Service nursery production; fiscal year 1979 (thousand trees)

Region	Nursery	Sold to Nursery region	Sold to Other regions	Sold to Other agencies	Surplus destroyed	Total production
1	Coeur d'Alene	7,774	3,799	270	0	11,843
2	Bessey	31	0	2,984	620	3,635
	Mt. Sopris	1,319	2,410	0	2,086	5,815
	Subtotal	1,350	2,410	2,984	2,706	9,450
4	Lucky Peak	6,673	3,962	559	673	11,867
5	Placerville	7,130	-	288	165	7,583
	Humboldt	5,686	6,181	4,399	396	16,662
	Subtotal	12,816	6,181	4,687	561	24,245
6	Medford	39	2,176	6	0	2,221
	Bend	9,486	0	376	266	10,128
	Wind River	26,054	0	5,191	4,430	35,675
	Subtotal	35,579	2,176	5,573	4,696	48,024
8	Ashe	23,706	0	497	0	24,203
	Caribbean	91	0	0	0	91
	Subtotal	23,797	0	497	0	24,294
9	Eveleth	2,305	0	0	0	2,305
	Toumey	5,081	0	0	12	5,093
	Subtotal	7,386	0	0	12	7,398
Grand total		95,375	18,528	14,570	8,648	137,121

Table C 18.--Containerized nursery stock production--fiscal year 1979 (thousand plantable trees)

Region	Facility	Number seeded	Plantable seedlings produced	Disposition		Produced for 1980
				National Forests	Sold	
1	Coeur d'Alene	2,520	2,332	2,234	98	0
2	Mt. Sopris	1,595	1,428	1,259	0	169
3	Albuquerque	375	199	199	0	0
5	Placerville	46	41	37	0	4
6	Beaver Creek	1,670	1,256	1,213	0	43
8	(2 locations)	953	803	748	10	45
9	(6 locations)	54	51	51	0	0
10	Petersburg	147	118	77	41	0
Total		7,360	6,228	5,818	149	261

Table C 19.--Other planting stock and seed acquisition--fiscal year 1979

Region	Planting stock (thousand trees)					Clean Seed (Pounds)				
	Service contract	Other regions	Other agencies	Commercial sources	Total	Service contract	Other regions	Other agencies	Commercial sources	Total
1	1,350	195			1,545					
2	674				674					
3		6,386			6,386					
4		138			138					
5	110	2,175			2,285	2,320	676	508	48	3,552
6	4,452	8,400	3,259	2,390	18,501		799			799
8			3,167	25	3,192				589	589
9			2,174		2,174					
10			33		33					
Total	6,586	17,294	8,633	2,415	34,928	2,320	1,475	508	637	4,940

Table C 20.--Actual grazing use--fiscal year 1979 (thousand animal unit months)

States	Cattle	Domestic horses	Sheep	Wild horses	Wild burros	Total
Alabama	8,989					8,989
Alaska						
Arizona	1,213,261	14,427	35,988	115	104	1,263,895
Arkansas	53,427	232				53,659
California	456,386	10,516	55,254	16,587	1,361	540,104
Colorado	788,866	17,045	151,130			957,041
Florida	21,298	26				21,324
Georgia	5,580	15				5,595
Idaho	586,696	14,738	203,052	101	6	804,593
Illinois	5,153	43	3,793			8,989
Indiana	186					186
Kansas	52,068	127				52,195
Kentucky						
Louisiana	37,907	891				38,798
Maine						
Michigan	246					246
Minnesota	1,280					1,280
Mississippi	14,491		3			14,494
Missouri	29,599	43				29,642
Montana	573,423	12,961	23,093	29		609,506
Nebraska	127,356	5	189			127,550
Nevada	248,525	727	34,817	8,936		293,005
New Hampshire						
New Mexico	754,871	9,120	33,560	3,247		800,798
New York	7,955					7,955
North Carolina	50					50
North Dakota	502,350	7,098	884			510,332
Ohio	569					569
Oklahoma	21,909	103				22,012
Oregon	497,632	3,983	48,335	3,600		553,550
Pennsylvania						
South Carolina	556					556
South Dakota	470,007	1,065	5,419			476,491
Tennessee						
Texas	77,358	61				77,419
Utah	444,602	7,167	201,976	936		654,681
Vermont	360	37				397
Virginia	4,057	1,030	188			5,275
Washington	104,654	4,437	4,301			113,392
West Virginia	8,659	101	352			9,112
Wisconsin	274	1				275
Wyoming	591,320	20,855	129,500			741,675
Total	7,711,920	126,854	931,834	33,551	1,471	8,805,630

Table C 21.--U,S. Dept. of Agriculture - Forest Service
Annual Grazing Statistical Report - FY 1979

	NO. OF PERMITTEES *	CATTLE NO.	CATTLE AUMS	HORSES & BURROS NO.	HORSES & BURROS AUMS	SHEEP & GOATS NO.	SHEEP & GOATS AUMS	TOTAL NO.	TOTAL AUMS
AUTHORIZED TO GRAZE		1,579,441	8,478,802	153,921	122,522	1,945,892	1,220,192	3,679,254	9,821,516
ACTUALLY GRAZED PAID PERMITS	15,968	1,338,606	7,671,488	14,416	56,440	1,165,046	922,693	2,518,068	8,650,621
FREE USE RECREATION STOCK	68,535	354	92	130,740	41,532			131,094	41,624
OTHER FREE USE	12,483	4,242	24,124	21,592	25,306	4,434	3,659	30,268	53,289
NON-NFS LANDS	230	54,427	302,987	373	4,167	31,246	26,402	86,046	333,556
CROSSING	75	21,475	3,749	180	83	78,298	4,571	99,953	8,403
UNAUTHORIZED USE	245	4,495	12,467	480	3,493	1,099	711	6,074	16,671
SUBTOTAL **	97,306	1,369,172	7,711,920	167,408	126,854	1,248,877	931,834	2,785,457	8,770,608
WILD HORSES				2,947	33,551			2,947	33,551
WILD BURROS				163	1,471			163	1,471
TOTAL ACT. GRAZED **	97,306	1,369,172	7,711,920	170,518	161,876	1,248,877	931,834	2,788,567	8,805,630
LOSSES									
POISONOUS PLANTS		1,749		1		2,087		3,837	
PREDATORS		730		32		14,755		15,517	
OTHER		5,140		57		6,699		11,896	

* PERMITTEES HOLDING PAID PERMITS ARE NOT COUNTED IN OTHER CATEGORIES
** NON-NFS LAND DATA NOT INCLUDED IN TOTALS

Table C 22.--Range allotment management--fiscal year 1979

Region	Total allotments	Allotments maintained to improved management status	Allotments on which improved management was started
1	2,196	916	64
2	2,653	1,730	260
3	1,528	839	133
4	1,962	1,018	90
5	875	501	109
6	893	393	99
8	640	226	76
9	220	75	66
10	-	-	-
Total	10,967	5,698	897

Table C 23.--Range improvements--fiscal year 1979

Code	Improvement type	Units of measure	Units of construction completed	Total cost
230	Range fence	(miles)	2,256.4	4,696,055
411	Spring	(sites)	796.1	953,898
412	Well	(sites)	99.0	639,134
413	Dam and reservoir	(sites)	674.9	317,645
415	Pit tank	(sites)	158.8	92,719
416	Trick tank	(sites)	30.1	295,961
421	Pump	(sites)	35.1	60,238
423	Pipeline	(sites)	7,681.9	1,162,135
425	Water storage tank	(sites)	174.2	311,600
611	Cattleguard	(sites)	364.6	751,295
612	Corral	(sites)	67.6	186,229
613	Dipping vat	(sites)	0	0
614	Trails and underpasses	(sites)	144.3	47,416
615	Loading	(sites)	6.0	2,141
	Total structural			9,516,466
910	Cover manipulation tall brush	(acres)	27,157.0	572,514
920	Cover manipulation short brush	(acres)	49,392.1	461,354
930	Range plant control	(acres)	5,255.6	212,404
940	Forage improvement	(acres)	97,921.1	983,244
960	Noxious farm weeds control	(acres)	15,397.3	594,857
	Total nonstructural			2,824,373
	Total all improvements			12,340,839

APPENDIX D

HUMAN RESOURCE PROGRAMS

Table D 1.--Young Adult Conservation Corps program summary--fiscal year 1979

Area Region Station	Appraised value of work accomplished	Enrollee on-board strength Sept. 29, 1979	Person-years of work
Areas			
Northeastern	$ 343,379	30	33
Southeastern	701,564	70	69
Regions:			
1. Northern	3,881,352	323	316
2. Rocky Mountain	5,991,930	148	268
3. Southwestern	7,254,868	831	592
4. Intermountain	7,037,815	380	441
5. Pacific Southwest	19,568,260	1,065	1,157
6. Pacific Northwest	10,367,825	653	816
8. Southern	11,985,636	1,207	1,123
9. Eastern	10,263,000	1,025	1,083
10. Alaska	8,901,241	340	400
Research units:			
Intermountain	329,352	35	34
North Central	370,711	49	53
Northeastern	217,933	43	46
Pacific Northwest	444,893	40	42
Pacific Southwest	362,107	32	34
Rocky Mountain	243,587	16	18
Southeastern	612,875	71	77
Southern	387,525	42	39
Forest Products Lab.	N/A 1/	N/A	N/A
Washington Office	112,489	9	13
Forest Service Totals	$89,378,342	6,409	6,654
Soil Conservation Service	454,384	24	35
Total	$89,832,726	6,433	6,689

1/ N/A stands for not applicable.

Table D 2.--Youth Conservation Corps program summary--fiscal year 1979 1/

Area Region Station	Appraised value of work accomplished	No. of participants	Minority participation (percent)	Person-years participation
Areas:				
Northeastern	$ 44,375	22	0	155
Southeastern	25,456	30	47	210
Regions:				
1. Northern	1,389,184	728	6	5,386
2. Rocky Mountain	1,492,377	653	15	4,937
3. Southwestern	2,088,958	960	51	7,039
4. Intermountain	2,323,140	831	7	5,973
5. Pacific Southwest	3,401,744	1,534	18	10,498
6. Pacific Northwest	2,118,890	759	12	5,598
8. Southern	5,413,680	3,160	28	22,191
9. Eastern	5,017,821	3,460	9	20,594
10. Alaska	479,406	180	33	1,267
Research units:				
Intermountain	92,869	60	5	262
North Central	N/A 2/	N/A	N/A	N/A
Northeastern	N/A	N/A	N/A	N/A
Pacific Northwest	N/A	N/A	N/A	N/A
Pacific Southwest	N/A	N/A	N/A	N/A
Rocky Mountain	N/A	N/A	N/A	N/A
Southeastern	N/A	N/A	N/A	N/A
Southern	N/A	N/A	N/A	N/A
Forest Products Lab.	N/A	N/A	N/A	N/A
Total	$23,887,900	12,377	19	84,110

1/ Figures are for the Forest Service only and do not include Department of the Interior or State grant programs. The estimated value of work is based on a printout dated November 20, 1979.

2/ N/A stands for not applicable.

Table D 3.--Job Corps program summary--fiscal year 1979

Area Region Station	Appraised value of work accomplished	Number of participants	Person-years of work
Areas:			
Northeastern	N/A 1/	N/A	N/A
Southeastern	N/A	N/A	N/A
Regions:			
1. Northern	$ 1,750,700	1,133	488
2. Rocky Mountain	1,492,280	985	432
3. Southwestern	N/A	N/A	N/A
4. Intermountain	N/A	N/A	N/A
5. Pacific Southwest	N/A	N/A	N/A
6. Pacific Northwest	2,640,355	1,923	888
8. Southern	5,581,269	4,742	1,409
9. Eastern	1,104,685	788	454
10. Alaska	N/A	N/A	N/A
Research units	N/A	N/A	N/A
Total	$12,569,289	9,571	3,631

1/ N/A stands for not applicable.

Table D 4.--Senior Community Service Employment program summary--fiscal year 1979 1/

Area Region Station	Appraised value of work accomplished	Number of participants	Person-years of work
Areas:			
Northeastern	$ 121,166	27	16
Southeastern	124,524	41	17
Regions:			
1. Northern	477,713	123	65
2. Rocky Mountain	581,151	174	79
3. Southwestern	1,229,300	272	123
4. Intermountain	1,512,800	293	156
5. Pacific Southwest	2,304,473	501	382
6. Pacific Northwest	1,554,390	330	164
8. Southern	6,297,849	1,372	743
9. Eastern	3,397,964	807	403
10. Alaska	N/A 2/	N/A	N/A
Research units:			
Intermountain	15,000	7	3
North Central	N/A	N/A	N/A
Northeastern	5,000	1	1
Pacific Northwest	68,520	12	6
Pacific Southwest	47,386	13	6
Rocky Mountain	22,339	9	3
Southeastern	21,502	13	3
Southern	35,301	22	5
Forest Products Lab.	N/A	N/A	N/A
Total	$17,816,378	4,017	2,175

1/ The program year is July 1, 1978, through June 30, 1979.

2/ N/A stands for not applicable.

Table D 5.--Volunteers in the National Forest program summary--fiscal year 1979

Area Region Station	Appraised value of work accomplished	Number of participants	Person-years of work
Areas:			
Northeastern	$ 0	0	0
Southeastern	3,500	2	1
Regions:			
1. Northern	275,693	401	31
2. Rocky Mountain	498,597	1,557	75
3. Southwestern	827,700	384	93
4. Intermountain	347,800	1,311	39
5. Pacific Southwest	1,045,431	4,889	126
6. Pacific Northwest	875,643	2,493	102
8. Southern	308,392	549	41
9. Eastern	169,395	391	26
10. Alaska	63,570	71	9
Research units:			
Intermountain	27,500	25	3
North Central	12,588	17	2
Northeastern	9,080	10	3
Pacific Northwest	87,200	87	5
Pacific Southwest	51,102	45	4
Rocky Mountain	12,681	15	1
Southeastern	32,500	30	3
Southern	0	0	0
Forest Products Lab.	2,012	2	1
Washington Office	50,000	15	4
Total	$4,700,384	12,294	569

Table D 6.--Other hosted human resource programs summary--fiscal year 1979 1/

Area Region Station	Appraised value of work accomplished	Number of participants	Person-years of work
Areas:			
Northeastern	$ 0	0	0
Southeastern	4,000	2	1
Regions:			
1. Northern	2,001,624	955	216
2. Rocky Mountain	634,202	480	78
3. Southwestern	480,300	206	51
4. Intermountain	873,000	784	97
5. Pacific Southwest	6,562,909	7,243	681
6. Pacific Northwest	2,498,988	1,120	295
8. Southern	1,073,543	380	125
9. Eastern	399,023	218	57
10. Alaska	320,026	94	22
Research units:			
Intermountain	68,000	42	11
North Central	4,350	4	2
Northeastern	120,141	32	14
Pacific Northwest	40,000	29	4
Pacific Southwest	59,400	39	7
Rocky Mountain	38,410	57	6
Southeastern	13,515	5	2
Southern	62,400	49	10
Forest Products Lab.	23,761	17	5
Total	$15,277,592	11,756	1,684

1/ This summary includes such programs as College Work Study, Work Incentives, Vocational Education Work Study, and others as well as programs authorized under the Comprehensive Employment and Training Act (CETA).

APPENDIX E

PESTICIDE USE ON NATIONAL FOREST SYSTEM LANDS

Table E 1.--Pesticide use report for fiscal year 1979

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
HERBICIDES			
Amitrole	Noxious weeds	357	610
	Conifer release	301(A)	514
	Rights-of-way	73	506
	Hardwood release	149	80
	Research	0.06	0.09
Ammonium sulfamate	General weed control	450	3,502
Asulam	Bracken fern control	5	17
Atrazine	Conifer release	3,808(A)	15,044
	Conifer release	522	1,996
	Site preparation	161(A)	648
	Site preparation	203	110
	Noxious weeds	62	248
	Weed and grass control	318	690
	Rights-of-way	33	117
	Range improvement	191	52
	Research	1.25	10
Atrazine plus dalapon	Site preparation	4	32
Benfluralin	Research	1.04	1.3
Bifenox	Site preparation	90	324
	General weed control	58	358
	Research	0.005	0.002
Bromacil	General weed control	7	863
	Rights-of-way	299	898
Bromacil plus diuron	Rights-of-way	97	344
Cacodylic acid	Thinning	249	128
Copper-ethanolamine chelated complex	General weed control	3	4
Dalapon	Site preparation	2,541	2,678
	Site preparation	391(A)	2,912

1/ Units treated are expressed in acres unless otherwise indicated. Aerial applications are indicated by (A). All others are ground applications.

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
HERBICIDES (con.)			
Dalapon (con.)	Conifer release	997(A)	3,800
	Conifer release	12	46
	General weed control	272	1,086
	Rights-of-way	5 acres and 92 miles of spots	81
	Research	1.3	8
DCPA	Nursery weed control	314	4,170
	Site preparation	131	2,011
	General weed control	57	513
	Research	0.002	0.032
Devrinol	General weed control	52	52
Dicamba	Noxious weeds	1,017	1,180
	Site preparation	20(A)	180
	Rights-of-way	0.1	0.3
	General weed control	23	44
Dichlobenil	General weed control	16	52
Diphenamid	Nursery weed control	118	1,412
	General weed control	52	166
	Site preparation	85	757
	Research	0.002	0.012
Diquat	Aquatic weed control	41	148
Diuron	Rights-of-way	147	1,646
	General weed control	44	130
	Research	0.12	0.24
DSMA	Rights-of-way	10 miles	104
Endothall	Aquatic weed control	21	51
Fenuron - TCA	General weed control	4	25
Fluometuron	General weed control	8	96
Fosamine ammonium	Conifer release	1,334(A)	4,728
	Rights-of-way	159	761
	Site preparation	39(A)	234

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
HERBICIDES (con.)			
Fosamine ammonium (con.)	Rights-of-way	12(A)	148
	Rights-of-way	352	1,930
	Wildlife habitat weed control	53	88
	Research	16(A)	50
Fosamine ammonium plus picloram	Rights-of-way	36(A)	286
Glyphosate	Conifer release	2,299(A)	3,586
	Conifer release	38	74
	Noxious weeds	524	1,087
	General weed control	514	1,009
	Site preparation	237	51
	Hardwood release	3	4
	Rights-of-way	2	4
	Research	51	26
Hexazinone	Conifer release	119	402
	Conifer release	190(A)	342
	General weed control	53	53
	Site preparation	21	32
	Research	1.25	10
Linuron	General weed control	39	39
	Research	0.12	0.12
Maleic hydrazide	General weed control	40	170
MCPA	Noxious weeds	182	367
Metolachlor	General weed control	50	69
MSMA	Thinning	3,558	18,604
MSMA plus dinitro	Grass control	52	84
Mineral spirits	Nursery weed control	37	3,000
	General weed control	52	3,600
Nitrofen	General weed control	52	450

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
HERBICIDES (con.)			
Oxadiazon	Research	0.002	0.009
Paraquat	General weed control	27 acres and 2,500 trees	15
Picloram	Noxious weeds	9,625	18,332
	Wildlife habitat weed control	3,021	4,006
	Poison plant control	280	561
	General weed control	160	654
	Range improvement	1,772	537
	Fire protection	192(A)	328
	Fire protection	199	249
	Rights-of-way	227	250
	Thinning	377	30
Prometone	General weed control	2	154
	Noxious weeds	5	10
Propazine	General weed control	14	28
Tebuthiuron	Rights-of-way	127	292
	Research	60	120
2,4-D	Conifer release	9,957(A)	23,656
	Conifer release	2,863	7,445
	Fire protection	4,218(A)	15,180
	Thinning	4,917(A)	14,751
	Thinning	4,863	14,461
	Range improvement	6,699	13,249
	Range improvement	10,042(A)	16,467
	Wildlife habitat weed control	3,522	9,139
	Noxious weeds	8,355	13,637
	Noxious weeds	40(A)	80
	Site preparation	725(A)	2,090
	Site preparation	13,291	46,704
	Nursery weed control	957	686
	Nursery weed control	535 miles	364
	Rights-of-way	1,796	2,818
	General weed control	680	1,546
	Research	16(A)	50

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
HERBICIDES (con.)			
2,4-D plus dicamba	Noxious weeds	3,596	10,910
	Rights-of-way	204 and 90 miles	491
	Wildlife habitat weed control	688	348
	Site preparation	810	2,025
	Release	773	1,197
2,4-D plus picloram	Site preparation	2,109(A)	10,132
	Site preparation	28,450	72,023
	Thinning	7,048	8,826
	Wildlife habitat weed control	2,437	2,335
	Noxious weeds	847	1,201
	Rights-of-way	1,913	8,325
	Rights-of-way	335(A)	1,743
	Release	13,597	29,332
	Range improvement	224	1,236
	General weed control	42	154
2,4-D plus 2,4-DP	Rights-of-way	1,824	5,211
	Site preparation	527(A)	2,208
	Site preparation	96	384
	Thinning	676	1,092
	General weed control	29	52
2,4-D plus 2,4-DP plus dicamba	Rights-of-way	108	345
2,4,5-T	Conifer release	390(A)	1,170
	Range improvement	15	40
2,3,6-TBA	Rights-of-way	5	5
Simazine	Rights-of-way	3,998	7,443
	Conifer release	105	1,956
	General weed control	165	407
	Nursery weed control	17	87
	Seed orchard weed control	2,250 tree bases	14
	Research	5	20

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
HERBICIDES (con.)			
Sodium metaborate tetrahydrate	Rights-of-way	10	500
	Noxious weeds	0.5	268
	General weed control	0.04	25
Triclopyr	Research	16(A)	50
Trifluralin	General weed control	33	7
	Research	0.062	0.062
Total 1979 Herbicide Use		184,047.85+	471,184.16
Total Aerial Use		43,088	120,377
INSECTICIDES AND ACARICIDES			
Abate	Mosquito control	94	4
Acephate	Spruce budworm control	23,400(A)	11,700
	Lodgepole needle miner control	12 trees	6
Allyl alcohol	Nursery pest control	11 beds	10 gals.
Azinphosmethyl	Seed and cone insect control	20 and 62,000 trees	4,324
Bacillus thuringiensis	General insect control	36	27
Cacodylic acid	Mountain pine beetle control	1,597 trees	211
Carbaryl	Spruce budworm control	41,600(A)	41,600
	Mountain pine beetle control	19,399 trees	4,898
	Range caterpillar and grasshoppers	5,450(A)	3,725

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
INSECTICIDES AND ACARICIDES (con.)			
Carbaryl (con.)	Rodent fleas	76 acres and 5 bait stations	57
	Grasshoppers	6	14
	Japanese beetle control	36	180
	Seed orchard insects	4,000	10
	Cutworms	4	8
	Aphid and caterpillar control	2	4
	Armyworm control	0.5	1
	Boll weevil control	4	11
Carbofuran	Seed and cone insect control	27,666 trees	4,269
	Pales weevil control	389	1,200
Chlordane	Cutworm control	8 nursery beds and 1,000 pots	7
Coumaphos	Cattle tick control	8 stations	1
Crotoxyphos	Livestock insect control	9,000 head	11
Crufamate	Livestock insect control	6,000 head	938
Diazinon	Nursery insect control	41	90
	Rodent fleas	5 bait stations	2
	Aphids, caterpillars, and leafhoppers	0.14	0.0006
	Cutworm control	52	30
	Roach, tick and chigger control	8	2
Dicofol	Spider mite control	0.84	0.48
Dienochlor	Spider mite control	1.31	0.5

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
INSECTICIDES AND ACARICIDES (con.)			
Dimethoate	Tip moth control	11	22
	Seed and cone insect control	12	4
	Birch leaf miner control	5 trees	0.5
Dursban	Mosquito control	16	0.8
Endosulfan	Peach borer control	5	10
Ethylene dibromide	Mountain pine beetle control	5,119 trees	2,521
Lindane	Dioryctria control	15 acres and 2,290 trees	31
	Mountain pine beetle control	150 trees	22
	Bark beetle control	3,000 trees	3
	Southern pine beetle control	190	140
	Western pine beetle control	62 trees	7
	Woolly aphid control	150	104
	Soil arthropod control	15	2
	Bronze birch borer control	5 trees	0.5
Malathion	Grasshopper control	187,254(A)	92,283
	Grassbug control	6,000(A)	1,125
	Scale control	2	14
	Livestock tick control	5,200 head	5
	Lodgepole needle miner control	12 trees	6
	Nursery insect control	23 acres and 6 beds	24
	Aphid control	2	2

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
INSECTICIDES AND ACARICIDES (con.)			
Malathion (con.)	Miscellaneous greenhouse, shrub, and tree insect control	85 acres, 17 sites, and 500 plants	53
Methoxychlor	Livestock insect control	172 head	6
Nucleopolyhedrosis virus	Douglas-fir tussock moth control	800(A)	80 x 109 activity units
Oil	Mosquito control	0.3	1
Oxdemeton-methyl	Cone insect control	100 trees	1
	Spider mite control	1,900	0.02
Permethrin	Western white pine cone beetle control	12 trees	0.5
Pyrethrin	Housefly and mosquito control	8 acres, 8 toilets, 2 garbage areas	2 plus 20 Aerosol
Tetrachlorvinphos	Bloodworm control	1 sewer plant	2
	Miscellaneous insect control	31	66
Toxaphene	Livestock insect control	6,058 head	2,295
Trichlorfon	Range caterpillar control	600(A)	900
Total 1979 Insecticide Use		272,420+	173,000+
Total Aerial Use		265,104	151,333

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
FUNGICIDES			
Anilazine	Blight control	36	108
Benomyl	Blight control	36	108
	Soil fungi control	55	262
	Damping off control	5 and 300,000 seedlings	80
	Seedbed disease control	56	66
	Root rot control	142	18
	Black walnut fungus control	2	2.5
	Leaf spot control	3 acres and 90 saplings	4
	Botrytis control	160,000 saplings	0.75
Borax	Root rot control	197	534
Bordeaux mixture	*Diplodia pinea* control	1.3	18
Captafol	Leaf spot control	6 saplings	1
Captan	Blight control	36	324
	Nursery fungi control	4	26
	Damping off control	0.33 acre and 22,000 seedlings	22.5
	Fungi control	0.1	9
	Botrytis control	5	7.5
Chlorothalonil	Botrytis control	160,000 seedlings	1.5
	Leaf spot control	6 saplings	1
	Nursery disease control	190	38
Copper hydroxide	Leaf blight control	0.5	1.54
Cycloheximide naramycin	Leaf spot control	6 saplings	1
Daconil	Brown spot control	5	30

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
FUNGICIDES (con.)			
DCNA	Botrytis control	5	3.5
Dichloropropene	Blight control	36	270
Dodine	Leaf spot control	6 saplings	1
Ferbam	Nursery rust control	52	1,272
Maneb	Lophodermium control	102	270
	Blight control	36	270
Thiram	Damping off control	553 lbs. seeds	1
Turban	Damping off control	0.08	1
Vorlex	Nursery pest	32	6,876
Total 1979 Fungicide Use		1,037+	10,628.79
RODENTICIDES			
Bonide	Rodent control	10	0.5
Sodium nitrate	Pocket gopher control	60	32
Strychnine	Pocket gopher control	23,902	2,979
	Mouse control	5	0.4
Warfarin	Mouse control	40 acres, 5 buildings and 18 stations	71
Zinc phosphide	Rodent control	3,000 acres and 50 tree bases	15.9
	Prairie dog control	17,903	5,967
Total 1979 Rodenticide Use		44,920+	9,066

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
FUMIGANTS			
Dazomet	Root rot control	30 pallets	4
	Soil pest control	12	4,900
Methyl bromide	Soil pathogen control	137	47,263
	Root rot control	12	6,100
	Soil fungi control	104	6,085
	Soil pest control	32	6,284
Total 1979 Fumigant Use		297+	70,636
ALGACIDES			
Algacide Type I	Greenhouse algae control	4 green-houses	52
Copper sulfate	Greenhouse algae control	4 green-houses	1
	Water algae control	45	272
K-Lox	Water algae control	7	3.2
Simazine	Water algae	2	80
Total 1979 Algacide Use		54+	408.2
PISICIDES			
Rotenone	Trash fish control	22 acres, 16 miles of stream, 217 acres of reservoir, and 4 lakes	915
Total 1979 Pisicide Use		239+	915

Table E 1.--Pesticide use report for fiscal year 1979 (con.)

Common name	Target pest/ purpose	Quantity treated/used Units 1/	Pounds
REPELLENTS			
Big game repellent (BGR)	Deer and elk	8,596	6,688
Thiram	Deer and elk	899	1,798
	Birds and rodents	21,752 lbs. seeds	651
	Rodents	7	0.25
Total 1979 Repellent	Use	9,502+	9,137.25
BEHAVIORAL CHEMICALS			
Methylcyclohexinone	Douglas-fir beetle anti-aggregation	100(A)	0.4
Pheromones	Moths	720	6
	Pine shoot borer	1,450(A)	10.7
Total 1979 Behavioral Chemical Use		2,270	17.1
Total Aerial Use		1,550	11.1
GRAND TOTAL PESTICIDE USE		514,782+	744,993

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